

Oklahoma-Texas Area

TECHNOLOGY RESEARCH
P. O. Box 267
Weslaco, TX 78596

April 2, 1982

SUBJECT: ARS-Form-457 for the Establishment of WRU 7304-20480
at Weslaco

TO: Billie Alley
Administrative Specialist
Oklahoma-Texas Area

I am forwarding the 457 for the establishment of 7304-20480 at Weslaco as you suggested. This draft has not been edited and may contain items that are not required. Please edit it for me and include it in the 457 that you are preparing for Screwworm Research.

Harold E. Brown

HAROLD E. BROWN
Research Leader

RECEIVED APR 14 1982

DIVISION OF ENTOMOLOGY — SCREW-WORM FLY UNIT

P.O. BOX 6712, BOROKO, PAPUA NEW GUINEA.

TELEPHONE PORT MORESBY 25 7596

Dr. D.H. Grahm,
U.S.D.A. Screw-worm Research,
P.O. Box 986,
MISSION, TEXAS
U.S.A. 78572

5th, April, 1982

Dear Hugh,

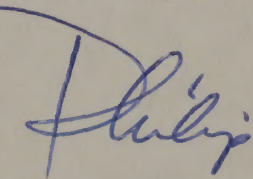
Many thanks for your letter of 15, March welcoming Peter Cassells to Mission and Tuxtla.

Unfortunately, Peter's itinerary will prevent him from visitation Mission on this occasion.

Peter Cassells arrives in Mexico City on flight MX145 at 08.00 on 20, April and catches the MX 213 to Tuxtla, departing 10.55 on the same day. No doubt if this flight is changed, people at Tuxtla will know and be able to meet him at the airport at the appropriate time. Peter leaves Tuxtla on 25, April on flight MX210.

I know both Peter and I will derive much from our respective visits and I look forward to meeting Dr. Whitten in Canberra at the Conference.

With Best Wishes,
Sincerly,

J.P. Spradbery

This item has been digitized as a selection from the Screwworm Eradication Collection.

Digital Item Number: 00303

Format: Report

Additional Format:

Author: James Kitzmiller,

Additional Authors:
Therese Markow, and Bruce Wallace

Recipient:

Date: 5- 9 April 1982

Report of the Technical Panel for the Study of Reproductive Isolation in
Screwworm Populations

Excerpt, pages 1-11

Note: Attached, memorandum copy, Recommendation of the Technical
Panel for the Study of Reproductive Isolation in Screwworm
Populations, to Graham

Screwworm Eradication Records
Screwworm Eradication Collection
Special Collections, National Agricultural Library

REPORT OF THE TECHNICAL PANEL FOR THE STUDY OF REPRODUCTIVE ISOLATION
IN SCREWORM POPULATIONS

MISSION, TX

April 5-9, 1982

The Panel has been asked to address the following questions during its stay in Texas: (1) Is there current scientific evidence which indicates the existence of reproductive isolation between screwworm populations? (2) What are the best methods that exist or that can be developed to detect reproductive isolation? (3) What methods should be used to construct factory strains from field collections? (4) Would it be advisable to maintain several strains in factory production for releases over ecologically diverse areas in Mexico? The Panel has attempted to address these questions, but has added additional comments of its own.

The Panel has been received warmly by many persons at Mission, including ARS and APHIS personnel, scientists at the University of Texas, Austin, and others; discussions at Mission and Austin have been frank and friendly. The Panel members wish to thank all concerned for the traditional Texas hospitality that has been extended to us.

The reading material that was provided to the Panel members in advance of the meeting is listed in Appendix A; the actual program of activities during the five-day stay in Texas (at both Mission and Austin) is presented in Appendix B.

Comments regarding the questions in our original charge are as follows:

1. Is there current scientific evidence which indicates the existence of reproductive isolation between screwworm populations? The available evidence has been interpreted differently by different workers. Analyses based on karyotypes, for example, have been pushed to or beyond the limits of technical resolution and, as a result, honest and competent investigators disagree. The Panel feels that additional analytical means must be found to address this problem properly and will return to this topic in a later section (Biology).
2. What are the best methods that exist or can be developed to detect reproductive isolation? Because the possible existence of reproductive isolation may crucially affect the continued success of the sterile male release program, more must be said on this question later. Every possible technique for revealing such isolation, if it exists, that has occurred to the Panel members, however, has hinged on the prior existence of isofemale lines; the urgency of maintaining such lines will be stressed below.
3. What methods should be used to construct factory strains from field collections? With our present knowledge, it seems prudent to use fly-determined matings within and between adults hatching from numerous egg masses collected within a sizeable, but local, geographic area.

This procedures could be incorporated as well into Dr. Bushland's A-B-C crossing procedure. With more precise information stemming from the use of isofemale lines, the recommended procedure might be greatly improved in the future; even now, however, it appears to provide the best answer to poorly understood natural problems.

4. Would it be advisable to maintain several strains on factory production for release over ecologically diverse areas in Mexico? The answer to this question, in the Panel's opinion, is "Yes" despite uncertainties of the population structure (one polymorphic species, several ecologically isolated populations, a number of cryptic, sibling species?) of screwworms. Indeed, we understand that the facility in Tuxtla can have two lines in production as well as several brood strains ready for production. Such flexibility is both desirable and important under any circumstance.

ISOFEMALE LINES

Gregor Mendel, in 1865, emphasized an essential feature of genetic (and genetic-related) studies: The pedigree of tested organisms must be known with certainty. Pedigree knowledge is largely lacking in screwworm research. As long as Cochliomyia hominivorax (the New World screwworm) was regarded as one species, and as long as the sterile male release program worked well, there appeared to be no need for knowing the pedigree of individual flies. Recalcitrant populations of screwworms that defied eradication by conventional releases, the need in some instances to increase the numbers of released flies 10-fold or more, the observation that males and females of certain strains fail to mate in the laboratory and the discovery of karyotypic variation among screwworm populations have raised questions concerning the single species concept. The consequences following from the existence of multiple cryptic species of screwworms with respect to the sterile male release program are so important that they cannot be ignored.

Opinions differ concerning the validity of the cryptic species concept of C. hominivorax. Screwworms may be members of one genetically polymorphic species or of a cluster of morphologically similar sibling species; isofemale lines--strains of screwworms each of which has descended from a single gravid native female--will be needed to determine which of these alternatives is true. The number of isofemale lines needed in order to unravel the taxonomic unknowns is not small: a dozen or more lines may be needed from each of a score or more geographically remote areas of the United States and Mexico. The pedigree of each line must be assured; inter-line contamination must not occur. Only the analysis of such lines and of their (deliberately planned) inter-line hybrids will reveal the true nature of screwworm populations.

Factories designed for the weekly production of hundreds of millions of adult screwworms cannot serve as the home for the isofemale lines that are needed

for research. The lines must not be contaminated; keeping them free from contamination in an environment where flies are raised by the hundreds of millions would be impossible. Workers--skilled and unskilled--whose pride in their work is based on the development and use of techniques of factory production are ill-suited for the small scale, even picayune, but essential steps and loving care that uncontaminated isofemale lines will require. If the latter are compared to the many cultures of one microorganism maintained in a bacterial stock center, the sterile screwworm production facility might be compared to a cheese factory: cheese makers do not necessarily make good bacterial stockkeepers.

The availability of isofemale lines of screwworms is essential for the future success of the screwworm control program. These stocks cannot be maintained in production facilities. Consequently, the Panel recommends the establishment of a screwworm isofemale line stock center. This center could be located at Mission, TX, at Fargo, ND, or elsewhere. The center would consist of facilities designed for the maintenance of contamination-free isofemale lines, of ancillary research laboratories for the permanent research staff, and additional laboratories that could be made available to visiting scientists, post-doctoral students or advanced graduate students. The permanent staff would consist of research scientists, their technicians and the technicians responsible for the maintenance of the isofemale lines. One of the research scientists (presumably the center's director) would be responsible for the center's operations. The Jackson Laboratory at Bar Harbor, Maine, might serve as a conceptual model: much of that laboratory serves to maintain the numerous mutant strains of mice; resident research scientists use certain of those strains in their personal research programs; visiting scientists are provided with research facilities and other guests are invited to the laboratory for seminars, symposia or informal discussions.

A number of comments and suggestions concerning studies that might possibly be carried out with reference to the biology of screwworms--especially with reference to the fly's reproductive behavior--constitute a subsequent section (Biology). These suggestions depend heavily upon the existence of isofemale lines (and upon inbred lines derived from them); consequently, that dependence will be emphasized now rather than later.

Karyotyping: Studies of the karyotypes of various screwworm strains (native and factory) have led to discordant conclusions. In part, disagreements result from the demands being made of a technique possessing limited resolution. Differences between the observations of different workers have been ascribed to the contamination of strains, hybridization and the collection of non-sibling larvae from wounds. Carefully maintained and reliable isofemale lines will not improve the resolving power of microscope lenses, but their use and the use of hybrids obtained by controlled crosses will decrease unwanted error variation.

Male Genitalia: The chitinous portions of male genitalia of insects have served as standard taxonomic tools for a century or more; screwworm biologists have understandably utilized these structures in their analyses. Again, observed variations in genital structures have been ascribed to different causes: cryptic species and, alternatively, variation correlated with age. Contamination of strains and the failure to recognize that the genitalia examined were from non-sibling individuals provide explanations once more for discordant conclusions; carefully maintained isofemale lines would provide the means for solving this problem.

Allozyme Variation: Allozyme variation presumably reflects genetic variation. Reliable studies include test crosses between individuals of known pedigree; predictions can be made in advance as to the results of each cross. Carefully maintained lines of flies are needed in order to interpret anomalous observations (for example, individual screwworms carrying three instead of two alleles of one enzyme have been reported). Again, the importance of isofemale lines is obvious.

Mating Behavior and Sexual Isolation: If cryptic species do occur within a collection of individuals of any sort, they can be detected only by analyzing results obtained by a series of single-pair (or single-strain) matings. If tested strains are themselves mixtures of unrecognized species (or, perhaps, of interspecific hybrid individuals), the presence of two or more species may easily escape detection. Isofemale lines are essential for any study of sexual isolation or of mating behavior.

Genetic Studies, Including Artificial Selection: The production of screwworms by the hundreds of millions under factory conditions results in tremendous selective pressures and micro-evolutionary changes in these artificially reared flies. The release of millions of sterile flies, in turn, causes tremendous selective changes in native populations. Existing populations of living organisms, one must remember, reflect the properties of their successfully breeding members. To understand whether changes in native populations reflect a turnover of unrecognized species or, alternatively, a change in the genetic composition of a single species, will require studies utilizing isofemale lines of assured purity.

The items listed above have been chosen to illustrate the importance of isofemale lines to the future success of the screwworm project. Panel members were unable to think of a single critical study of the structure of screwworm populations that did not call eventually for the existence and use of isofemale lines of assured purity . . . lines, as Mendel said, whose pedigrees are known.

BIOLOGY: INTRODUCTION

The screwworm problem is a biological problem. This statement appears trite, but it bears on both the success of the eradication program in the past and problems and potential disasters of the future.

The release of sterile males has succeeded in eliminating screwworms from the United States because the presence of these males interrupted an essential step in the reproduction of native screwworms: native females for the most part did not mate with native males. The perpetuation of any population or species of many sexually reproducing organisms depends upon the survival of sufficient individuals, their meeting and mating, and the discovery by gravid females of sites suitable for the survival of their progeny. Should the organism be a pest, control or eradication can be achieved by interrupting its reproductive cycle at any convenient point. The release of sterile males interferes with the meeting and mating of adult screwworms.

The success of living organisms in responding to various challenges is recognized in the terms "adaptation" and "evolution." Because it can mutate and because mutated DNA replicates as faithfully as nonmutated DNA, it arrives at logical solutions to problems affecting the reproduction of individuals and the perpetuation of populations. This is also a matter of biology. Screwworm adults that successfully meet and mate despite the presence of sterile males are those that determine the nature of succeeding generations. The successful reproducers may differ genetically from the unsuccessful ones; the outcome is a more-or-less gradual change in the genetic composition of the native population. Under some conditions, it may develop that the successful reproducers belong to a different species; the native flies in this case undergo a change in species composition. This change may, in fact, occur with no obvious change in the total number of adult screwworm flies.

The following paragraphs emphasize the importance to the control program of knowledge concerning the biology of screwworm flies. The Panel members are biologists and geneticists but are not screwworm biologists; consequently, we have attempted to avoid becoming too deeply concerned with the procedures and techniques of screwworm specialists.

BIOLOGY: TAXONOMY

Obviously, a quick and easy way must be found to identify screwworm populations. Conventional taxonomy is clearly one approach (see D. G. Hall, Blowflies of North America, ESA, Thomas Say Foundation, Vol. 1, 1948). Ray Gagné, USDA, of the United States National Museum, is probably best qualified in taxonomy of Calliphoridae.

Eggs: Are there any taxonomic studies involving eggs? Have there been SEM studies? In many Diptera (Anopheles, Drosophila), there are clear

differences in the shape, configuration of parts and color patterns which can be used to differentiate even sibling species (Maculipennis Complex).

Larvae: Many dipterans show clearly consistent differences in larval structures, such as chaetotaxy, proportions of structures and the presence or absence of structures. Such traits have served as the basis of taxonomic keys. Screwworms seem to possess such structures. Have these been used in attempting to classify these flies? Is anyone working seriously on larval taxonomy? Intensive research in this area should be undertaken.

Pupae: In most Diptera, pupal taxonomy is difficult; still, it is not impossible. Are studies of pupae in progress?

Adults: In many Diptera, the morphology of the male genitalia is an important taxonomic character. Is this true for Calliphoridae? Gagné suggests that structures of the male genitalia are subject to change with usage; therefore, "good" taxonomy can only be done with unmated males.

A series of questions arise: What work has been done with "native" Calliphoridae? How valid is it? What criteria, if any, exist for distinguishing potential sibling species? How do the experts identify screwworm species? What structures are used in present studies? What competent taxonomist might be induced to work on these flies?

Ordinary taxonomic (morphological) features work well in separating species, but not so well at the intraspecific level. Perhaps studies on mitochondrial DNA could be of value; immunological studies could also be attempted.

Chromosomes: Considerable work has been done on somatic karyotypes using larval brain cells; this work should be expanded in a search for additional sources of information.

The study of meiotic chromosomes should give considerable information on chromosome pairing, meiotic stages, centromeric position and variability at metaphase I and metaphase II. The details of meiosis might be studied in both males and females.

A serious effort might also be made to incorporate colchicine pre-treatment into the technique for the preparation of karyotypes. In some organisms the frequency of readable karyotypes following colchicine treatment is increased 100-fold.

Thus far, little success has been met in the study of polytene chromosomes. In the screwworm these chromosomes spread poorly; nevertheless, intensified research might lead to readable chromosome preparations. Such success has been achieved in the study of houseflies and mosquitoes.

Allozymes: The development of techniques by which differences between enzymes and other protein molecules (allozymes) can be easily and rapidly revealed

has greatly altered the nature of the genetic analyses of populations during the last decade. While it is true that allozyme analyses have not solved all problems confronting population biologists, it is true, nevertheless, that a failure to utilize such analyses could lead to the neglect of certain important aspects of the screwworm problem.

Allozymes offer a simple means for differentiating between local populations. A single interbreeding population is characterized by certain gene and zygotic frequencies; samples of individuals that are taken at two localities and which differ in these frequencies must represent two at least partially isolated populations.

A deficit of heterozygous individuals within a sample of individuals taken at one locality, especially if several loci show corresponding deficits, suggest that the tested individuals are not members of a single population of randomly breeding individuals. Although alternative explanations are possible, deficits of heterozygotes suggest either that high levels of inbreeding exist (selfing in plants, for example) or that ecological or other cryptic species co-exist at the sampled locality.

In several studies, allozyme variation has been successfully correlated with environmental or other ecological conditions (including, for example, the time of day during which butterflies are in flight); such correlations, once found, convert allozyme data into predictive data. This aspect of allozyme data could serve an important function in the evaluation of factory strains intended for release in population control.

Mating Behavior: Because different species may not exhibit karyotypic, morphological or electrophoretic indicators, mating tests may be needed to reveal the existence of reproductively isolated populations. A number of standard experimental designs exist in the dipteran literature for observing behavioral isolation. A multiple choice design is a logical starting point for studies with the screwworm. While laboratory conditions can never mimic conditions in nature, certain precautions, such as the use of low densities of flies, can be taken to reduce artifactual effects in laboratory experiments. A good control would be the ability to obtain and measure behavioral isolation between C. hominivorax and C. macellaria in comparable tests. C. hominivorax from various isofemale strains extracted from different parts of the range should be tested pairwise. Positive assortative mating between isofemale strains would suggest that correlated differences in karyotypes, genitalia and allozymes be sought. These studies might be extended to an examination of cuticular hydrocarbons that influence mating behavior.

BIOLOGY: THE NATURAL HISTORY AND FIELD ECOLOGY OF SCREWORMS

To the extent that organized information is lacking, collection records of screwworms should be obtained and museum specimens examined in order to compile information on the geographic distribution of C. hominivorax and its

relatives. Such information is available in great detail for many genera of little or no economic importance; similar information should be part of the armory of those combatting screwworms.

Field data on the sizes, densities and composition of local populations should be collected routinely and included in the background information concerning these insects. Identification and characterization of the feeding substrate and foraging strategy of adult males and females would aid in these studies. Field ecologists with expertise on finding and observing native insects should be consulted or employed in studying wild screwworms. Capture-, mark- and release experiments of various sorts should be tested in order to determine the reliability of data obtained by any one procedure. During these studies there should be an intensive search for the occurrence of natural predators and parasites which might be incorporated into future biological control programs.

Rather than being satisfied with ad hoc or post hoc rationalizations of serious screwworm infestations, a body of knowledge should be obtained that provides those concerned with considerable predictive power. The complex topography of Mexico will require these persons to have considerable information not now available. Certain aspects of the fly's ecology and behavior--dispersal, monogamy and reaction to natural and synthetic attractants--are so important that they should be subjected to periodic scrutiny at frequent intervals. Many of the literature references, even now, are to studies carried out twenty or so years ago; unpublished data of more recent origin may be available "in-house" but these, we must recall, have not been subjected to critical peer scrutiny.

Because the success of any release program depends upon the ability of flies to participate in a number of steps in the reproductive process, laboratory and field experiments should be designed to generate as complete a picture as possible of the reproductive biology of the screwworm. The sites where mating takes place, and the time of day, the relationship between mating and dispersal, and the influence of variability in light, temperature and humidity on mating should be discovered and described. An understanding of the impact of multiple male mating on subsequent male fertility is highly desirable for assessing the impact of sterile females released into the natural population. The possibility that females are not always monogamous should be investigated. Experiments should be designed to detect the existence of heritable differences in host (oviposition site) preferences. Those reproductive behaviors which may be genetically variable can be determined by comparative studies using isofemale lines and by making repeated observations on populations in given localities.

BIOLOGY: MISCELLANY

Genetic Engineering: There are several aspects of genetic engineering that deserve consideration and development. Perhaps the most important of these

is the development of a genetic sexing system, similar to that engineered in Anopheles albimanus. In that case, a dominant gene for propoxur resistance was incorporated in the Y-chromosome by means of an artificially induced translocation. Treatment of eggs and larvae with propoxur kills all females; the resistant males survive.

Photoperiod: The importance of keeping factory-produced insects on a photoperiod throughout the life cycle must be emphasized. Without a properly regulated photoperiod, factory-reared insects may prove to be active at the wrong time and, consequently, not able to compete for wild mates following their release.

EDUCATION

Public: The very success of the sterile male release program in eliminating (or at least, greatly reducing) screwworms from large areas of the United States and Mexico has led to profound changes in animal husbandry practices; these changes extend from the laying off of rangehands, to an extension of calving times, to the introduction of deer and other wild animals into rangelands. It has occurred to the Panel as it has to many others that these changes, though reasonable in the absence of screwworms, are precisely those which would greatly enhance the spread of a screwworm infestation were a new one to occur. Just as medical doctors have learned to their dismay that antibiotics cannot control modern epidemics of venereal disease, agricultural specialists may learn that serious screwworm epidemics can return in the future.

The only answers to the threat of future epidemics (short of the total eradication of every screwworm fly) seem to be public education and an organized fight against complacency. The responsibility for public education rests with neither ARS nor APHIS; nevertheless, these groups can and should accept responsibility for the education of those who do instruct the public--public school teachers, county agents and other USDA personnel. Public school teachers--elementary and high school--have been included here because the natural history of screwworms could easily serve as the basis for laboratory demonstrations in biology courses at several levels.

Project Personnel: The Panel members, having engaged in enthusiastic discussions with the project scientists, sense a genuine appreciation for our brief presence at Mission. Therefore, we recommend that every effort be made to see that two or three "outside biologists" be invited to Mission for mini-symposia of three to five days duration on a regular (annual? biannual?) basis. Considering the total budget, the cost of such visits (travel and housing only) would be rather trivial. The choice of invited guests would depend upon specific problems facing the program, each of which require specific expertise: release-recapture studies, mate-recognition, karyotyping, synthetic pheromones and field (micro) ecology, for instance.

If a center for the maintenance of isofemale lines were to be established at Mission, Fargo, or elsewhere, laboratory space for visiting scientists should be provided. First, security measures forbid the export of screwworm strains to workers at other institutions; therefore, interested scientists should be invited to the center. Second, resident personnel would profit from an extended exchange of ideas with these visiting scientists; the opportunity for such exchanges would greatly increase the attractiveness of research positions at the proposed center. Third, provision of laboratory space for visiting scientists need not be borne by the center: a charge (optional?) could be assessed for laboratory space; this would normally be covered by each visitor's research support. Fourth, the availability of laboratory space for visiting scientists would largely eliminate divergent interpretations of identical data; colleagues with divergent views generally devise means for resolving their differences if they have an opportunity to carry out cooperative research.

SUMMARY

The Panel recognizes the unparalleled success of the screwworm eradication program, a success that cannot be denied even though an occasional recalcitrant population has been encountered. It also recognizes that this success was achieved despite a relative lack of knowledge concerning the basic biology of screwworm flies. (Recall, too, that the original improvement in agricultural plants and animals was made by primitive peoples who knew only that like begets like.) The Panel also recognizes the dedication and competence of the many persons who have worked and are still working on the control of screwworms.

Because the success of the screwworm project was achieved with a limited knowledge of screwworm biology, the Panel fears that any future failure of the program might be viewed as a mystery to be explained away by ad hoc interpretations of largely irrelevant information. Consequently, in its deliberations, the Panel has seen fit to stress the importance of basic screwworm biology. The urgency for gaining such basic information lies in the growing evidence (presently a cloud "no larger than a man's hand") that what has been regarded as a single species of insect may be, in fact, a cluster of hitherto unrecognized sibling species. From our deliberations have emerged the following recommendations:

1. A stock center for the maintenance of isofemale and inbred lines, kept under rigid genetic protocols, should be established. The Panel considers this to be by far the most important recommendation; the creation of the center should be given highest priority.
2. The success of the program (most years) is prima facie evidence that most factory strains ARE sexually compatible with wild strains. Continue the present program with improvements whenever possible.

3. Current methods used to define populations (gamodemes) have been pushed to the limit of resolution; new methods must be searched for and refined.
4. A dipteran taxonomist is a sine qua non at this point. If "gamodemes" are really sibling species (nonpanmictic populations), they must be properly identified.
5. A major effort concerning the genetics of screwworms should be mounted, comparable in scope to past research on Drosophila paulistorum and Anopheles gambiae; karyotypes, polytene chromosomes, translocations, inversions, gene markers and allozyme variation must be thoroughly studied.
6. Studies of mating behavior and sexual isolation should be continued and encouraged.
7. An efficient method for eliminating female flies from among those released should be sought.
8. Basic biological research should not be neglected. There is an urgent need to generate a body of data on the field biology, natural history and population ecology of the screwworm. A balanced research effort is a necessary arm of the sterile male release program.
9. New factory strains should be begun with numerous egg masses collected from within a sizeable, but local, geographic area and propagated by fly-choice methods.
10. Factory production at Tuxtla should continued to maintain its flexibility with respect to strains that are in production.
11. There should be an intensive search (especially in South America) for natural predators and parasites of the screwworm.
12. Strong efforts should be made to attract grants from traditional funding agencies to support the basic biology investigations.
13. An education program for both the public and for project personnel should be initiated.

April 9, 1982

JAMES B. KITZMILLER

THERESE MARKOW

BRUCE WALLACE

WEDNESDAY, APRIL 7

Travel to Austin, TX.. Plane departs McAllen at 6:45 a.m. and returns the same day. Lv Austin at 4:30 - Ar McAllen 6:00 p.m. (Visit scientists at University of Texas).

THURSDAY, APRIL 8

- 8:15 a.m. Open Discussion -- Possible Additional Kinds of Genetic Studies on Screwworm Populations.
- 10:00 a.m. Panel Members and Secretary -- Discussion and Drafting of Report.
- 7:00 p.m. Dinner and shopping in Reynosa, Mexico.
Leave motel at 6:30 p.m.

FRIDAY, APRIL 9

- 8:15-5:00 Further Discussions and Drafting of Final Report.

Note: Panel members are encouraged to suggest alternative topics for discussion. We hope to keep the schedule flexible and allow ample time for questions.

BACKGROUND READING MATERIAL FOR THE TECHNICAL PANEL FOR THE STUDY OF POTENTIAL REPRODUCTIVE ISOLATION IN SCREWORM POPULATIONS

A. PUBLISHED RESEARCH:

- M. 1. "Effects of Irradiation on the Screwworm, Callitroga hominivorax (Cocq.)" by Kaufman and Wasserman (1957).
- M. 2. "Reproductive System and Terminalia of the Old World Screwworm Fly, Chrysomya bezziana Villeneuve" by Spradbury and Sands (1976).
- F. 3. "Use of Isozyme Technique to Assess the Quality of Mass-Reared Sterile Screwworm Flies" by Whitten (1980).
- M. 4. "Cytotaxonomy of Calliphoridae (Diptera)" by Boyes and Shewell (1975).
- M. 5. "Chromosome Variation within Drosophila simulans detected by Quinacrine Staining" by Ellison and Barr (1971).
- M. 6. "Quinacrine Fluorescence of Specific Chromosome Regions: Late Replication and High A:T Content in Sanoaia leonensis" by Ellison and Barr (1972).
- M. 7. "Cytogenetics of a Local Population of the Screwworm, Cochliomyia hominivorax, from Northeastern Mexico" by McInnis (1981).
- M. 8. "Screwworm Eradication: Inadvertent Selection for Noncompetitive Ecotypes During Mass Rearing" by Bush, Neck and Kitto (1976).
- M. 9. "Screw-worms" by Baumhover, Husman and Graham (1966).
- M. 10. "Mating Behavior of the Screwworm Fly as Affected Differences in Strain and Size" by Alley and Hightower (1966).
- M. 11. "Field Tests of Sterile Screwworm Flies, Cochliomyia hominivorax (Diptera: Calliphoridae), Against Natural Populations in Three Coastal Areas of Mexico" by Krafur and Hightower (1979).
- M. 12. "Ecological Genetics of the Screwworm Fly, Cochliomyia hominivorax (Diptera: Calliphoridae) and Its Bearing on the Quality Control of Mass-Reared Insects" by Bush and Neck (1976).
- F. 13. "The Screwworm Problem -- Evolution of Resistance to Biological Control," R. H. Richardson, Editor (1978).

M. = Mailed from Mission, Tx

F. = Mailed from Fargo, ND

TENTATIVE AGENDA

Technical Panel for the Study of Reproductive Isolation in
Screwworm Populations

Mission, Texas - April 5-9, 1982

MONDAY, APRIL 5th

- 7:30 a.m. Assemble in lobby of La Quinta Motel for transport to Mission, TX (same the rest of the week)
- 8:15 a.m. Opening Remarks -- Ralph Bram and Leo E. LaChance
- 8:30 a.m. Perspectives on Screwworm Eradication Programs -- M. Meadows, APHIS (discussion and questions from panel).
- 10:30 a.m. Execution and Problems Associated with Mexican Program -- H. C. Hofmann, APHIS, Mexico City.
- 12:00 noon LUNCH
- 1:30 p.m. History of Factory Strains - C. J. Whitten, ARS, Fargo, ND
- 2:00 p.m. ARS Research in Support of Eradication Program at Tuxtla and Fargo -- R. Bram, O. H. Graham, and C. J. Whitten
- 3:00 p.m. Screwworm Population Studies Prior to Arriaga Test:
 Isozyme Studies ----- C. J. Whitten
 Cytogenetic Studies ----- D. O. McInnis, ARS, Mission, TX
 Laboratory Mating Studies - C. J. Whitten & D. O. McInnis

TUESDAY, APRIL 6th

- 8:00 a.m. Tour of SWASS Manufacturing Operation
 Tour of APHIS Screwworm Plant (not in operation)
 Movie on Mexican Screwworm Program
- 9:30 a.m. Open Discussion on Past Problems in Screwworm Eradication
 (Puerto Rico, Vieques, Tamaulipas, etc.)
 Respondents: Lloyd Wendell, Bill Sudlow and Chris Hofmann
- 11:00 a.m. The Arriaga Test: Execution and Sample Collection -- C. J. Whitten
- 12:00 noon LUNCH
- 1:15 p.m. Cytogenetic Studies - D. O. McInnis
- 3:30 p.m. Open Discussion on Arriaga Test

- F. 14. "Screwworm Research and Eradication," by R. C. Bushland, Bull. Entomol. Soc. Amer. 2(1): 23-26 (1975).
- F. 15. "Genetic Strategies Affecting the Success and Economy of the Sterile Insect Release Method" by L. E. LaChance, Rockefeller Symposium (1979).
- F. 16. "Releases by Sterile Screwworm Flies in Northern Veracruz, Mexico, Measured by Recovery of Sterile Egg Masses" by R. B. Davis et al. J. Econ. Entomol. 61(1): 96-101 (1968).
- F. 17. "Field Tests of Sterile Screwworm Flies, Cochliomyia hominivorax (Diptera: Calliphoridae), Against Natural Populations in Three Coastal Areas of Mexico" by E. S. Krafur and B. G. Hightower. J. Med. Entomol. 16:33-42 (1979).
- F. 18. "Responses of Screwworm (Diptera: Calliphoridae) Populations to Sterile Male Challenge in Veracruz," E. S. Krafur et al., Med. Entomol. 17: 235-241 (1980).
- F. 19. "Responses of the Screwworm, Cochliomyia hominivorax, to Two Sterile Male Release Methods in South Texas, 1975-1976" by E. S. Krafur and Luis Garcia. J. Med. Entomol. 14:687-697 (1978).
- F. 20. "Field Observations on the Effects of Releasing Sterile Screwworms in Florida" by A. H. Baumhover et al., J. Econ. Entomol. 52(6): 1202-1206 (1959).
- F. 21. "Screwworm Control Through Release of Sterilized Flies" by A. H. Baumhover et al., J. Econ. Entomol. 48(4):462-466 (1955).
- F. 22. "Autocidal Control of Screwworms in North America" by R. H. Richardson et al., Science 215: 361-370.

B. TECHNICAL MEETING SYNOPSES AND UNPUBLISHED RESEARCH:

M. 1. Quarterly Reports of the Screwworm Research Laboratory

- A) Report of April, May and June 1979.
- B) Report of July, August and September 1979.

(Only select portions of these reports are relevant).

M. 2. Technical Conference Meetings

- A) February 21, 1979
- B) May 22, 1979
- C) July 31, 1979
- D) December 12, 1979
- E) May 8, 1980
- F) July 16, 1981

(Perhaps only the selections of these reports dealing with research are relevant. The remaining technical meetings had little, if anything, to report on our subject.)

M. 3. University of Texas Annual Reports

- A) 1979
- B) 1980
- C) 1981 (this includes a research proposal for 1982)

M. 4. "ARS Report on the Arriaga Genetics Study" by McInnis, Whitten, Spencer, Mackley and Peterson (1981)

M. 5. "Genetic Studies of Screwworms, Cochliomyia hominivorax from Mexico" by McInnis, Whitten, Spencer, Mackley and Peterson. (Journal article in preparation 1982).

F. 6. "The Genetics of Unmated Male Screwworms, Cochliomyia hominivorax (Cocq.)" by Gagné (in preparation 1982).

F. 7. "Evaluation of the Simaloa Strain on the Eastern Coast of Mexico" by Whitten et al., Nov. 24, 1980.

F. 8. "Evaluation of the DE-9 and Aricruz Strains in Sinaloa" by Whitten et al., Feb. 15, 1980.

F. 9. "Screwworm Karyotypes and Spermatogenesis," by J. G. Riemann, pp. 100-104 of the Mission Quarterly Report - Circa 1963.

C. OTHER DOCUMENTS AND MEMORANDA:

- F. 1. The Eden-Lincoln Report on the Screwworm Program (Sept. 1974).
- F. 2. Interim Report on Cooperative Agreement at Fargo, ND (Dec. 1981).
- M. 3. Recommendations by the Screwworm Study Group of Drs. Bushland, Knippling and Lindquist (Feb. 1979).
- M. 4. "The Interaction of the Environment with Heredity in the Eradication of the Screwworm Fly and the Relationship of Field Observations to the Strains versus Species Question" by Beal (Mar. 1981).
- M. 5. "Protocol for the Development of New Screwworm Strains" by McInnis (Sept. 1981).
- F. 6. "Genetic considerations in the establishment of screwworm factory strains" by LaChance, Seawright, McInnis and Lindquist (July 1980).
- F. 7. "Eradication and Suppression of the Screwworm Fly by the Sterile Male Technique" by Bushland (1978). (National Academy of Sciences document).
- M. 8. "Annotated Bibliography of the Screwworm, Cochliomyia hominivorax (Coquerel)" by Snow, Siebenaler and Newell (Jan. 1981).

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DR. O.H. GRAHAM
AGR RESEARCH SERVICE
SCREWORM RESEARCH
POBOX 986

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United States
Department of
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Agricultural
Research
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Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 7, 1982

Dr. Richard E. Lee, Jr.
Department of Biology
University of Houston
Houston, Texas 77004

Dear Dr. Lee:

Dr. R. A. Bram of our National Program Staff recently forwarded a copy of your curriculum vitae to me. While we do not have any vacancies on our staff at the moment, there is a very good possibility that we have a vacancy later this year for a research entomologist in our laboratory at Tuxtla Gutierrez, Chiapas. If you would like to apply for such a position please forward me a completed SF-171, Application for Federal Employment.

The duties will primarily require research in the behavioral physiology of screwworm flies and the incumbent will have to speak Spanish or be willing to learn Spanish.

Sincerely,

O. H. GRAHAM
Location/Project Leader

cc: R. A. Bram, SS, Beltsville
R. A Hoffman, AAD, College Station



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 7, 1982

SUBJECT: SWASS Field Tests

TO: Dr. Nazario Pineda V., Director
Dr. Robert Reichard, Acting Co-Director
Comision Mexico-Americana Para
La Eradicacion del Gusano
Barrenador
Leibnitz No. 20 - 12^o Piso
Mexico, 1, D. F.

Our scientists are continuing to evaluate a new formulation of swormlure (ZP-31) in western Mexico and have completed three phases of a field trial. We have been greatly assisted by Dr. Asin and several other people in Region III, but Jim Bruce has been especially helpful.

A copy of a preliminary report for Phase II and a protocol for Phase III are enclosed for your information. You will note that during Phase II (March 4-11) both pellets formulated with ZP-31 and traps baited with ZP-31 attracted slightly more than 2X the number attracted to Swormlure-2. The data from Phase III have not yet been summarized, but it appears that the 2 to 1 ratio will hold up.

The total number of screwworm flies trapped continues to be low and we remain unsure of the cause. Tests with dye-marked flies that are being conducted by Methods Development under the supervision of Mr. Bruce and Dr. Richard will provide information on the longevity of the sterile flies.

Samples of swormlure and SWASS are currently being analyzed by Dr. Brown and Paul Thompson at Weslaco.

O. H. GRAHAM
Location/Project Leader

Enclosure: copy of report
" " protocol

cc: N. L. Meyer, ADA, Washington, D. C.
F. E. Smith, CSV, Hyattsville
R. A. Bram, SS, Beltsville
H. C. Hofmann, Ent. Adv., Mexico City
J. R. Johnston, AD, College Station
H. E. Brown, RL, Weslaco
D. R. Ring, Res. Ent., Mission

Field Observations on Two Formulations of Swormlure (SL-2 and SL-ZP-31) in Colima

Dennis R. Ring
Melquiades P. Leal
Jim Bruce

The following is a report on the second field test of SWASS and Swormlure (SL). The attractiveness of SL-2 was compared to SL-ZP-31 (a formulation of SL obtained through Jim Mackley's research) near Manzanillo, Mexico.

Twenty pairs of kill buckets were suspended in trees on ranches near Manzanillo, Colima, Mexico. Bucket pairs were at least 1 mile apart and 1 bucket was baited with two SL-2 pellets and the other with two SL-ZP-31 pellets in each pair. Also 10 pairs of wind oriented traps (WOT's) were suspended in trees at 10 of the sites and one WOT was baited with standard SL-2 while the other was baited with SL-ZP-31 of each pair. WOT's were separated from buckets by at least 350 meters while WOT's and buckets were separated from their corresponding pair mates by at least 50 meters. Five WOT's were placed with the 1st 10 bucket traps and 5 were placed with the 2nd 10 bucket traps. All traps were reversed daily in the morning, examined twice a day and examined in the same order each time. All flies caught in the traps were identified in the field as screwworm, C. macellaria, Chrysomia rufifacies or all other Diptera. Screwworms were identified by sex, placed in liquid nitrogen and transported to Mission, Texas for further study.

Traps were set up and baited on March 3, 1982, and rebaited on March 8, 1982. Observations on trap catches were made every day from March 4, 1982, through March 11, 1982. Traps were checked on March 11, 1982, in the morning only. During this time, observations were recorded by Methods Development personnel on the number of egg masses (and whether or not they were sterile) collected from five sheep pens on the same route as the one the traps were placed on and 3 sheep pens a few miles north of the traps. Each pen had 2 wounded animals and was checked twice a day. Egg masses were collected and observed for hatch 24 and 48 hours after collection.

A regular grid of sterile flies was to be released in this area on Tuesdays and Thursdays during this study. Additionally, 1,600 sterile flies/mi.² were released in this area during this study on Mondays, Wednesdays and Fridays. Flies released on Monday, March 8, 1982, were dyed green with florescent dye and those released Wednesday, March 10, 1982, were dyed red or yellow.

Samples of both types of pellets and SL's were taken throughout the test. All such samples were given to Paul Thompson and Dr. Brown for analyses. Both types of pellets and SL's were placed in the field on March 3, 1982. Pellets were placed in WOT's while SL's were not placed in traps. Samples of pellets (6-8) were taken on that day and each subsequent day throughout the test. These pellets were replaced with fresh pellets on the same day fresh pellets were placed in buckets. Pellet samples were placed in small glass jars; labeled; sealed with saran wrap, jar lids and electrician's tape and placed on dry ice. Other pellet samples were taken before leaving Mission (SL-ZP-31), at the Manzanillo airport (SL-2) and on return to Mission (both).

Swormlure samples were taken on day 0, 3, 5, 7 and 9 of the test. This consisted of capping the bottle, labeling the sample, taping the cap with electrician's tape and placing the sample on dry ice. Additional SL samples of both SL's were taken before leaving and upon return to Mission.

Two bags of standard SL-2 pellets were examined at Manzanillo airport. These bags were taken from the bottom of stacks and checked for broken pellets and fines. Pellet samples were taken and treated as previously from each of these bags.

Two minimum-maximum thermometers were placed in the field on March 4, 1982, and temperatures were recorded daily in the morning except on the 4th when they were recorded in the afternoon.

A difference was shown between SL-ZP-31 and SL-2, the day on which flies were collected and the trap used by statistical analysis. Similar results were obtained for males, females and total screwworms. SL-ZP-31 caught more males, females and total screwworms than SL-2 (Table 1). The ratio of SL-ZP-31: SL-2 ranged from 1.35: 1 to 2.96: 1 with an overall average of 2.10: 1. The highest ratio of SL-ZP-31 to SL-2 was observed 1 day after baiting traps and a decline in this ratio was observed with time.

More screwworms were caught the 1st two days after baiting the traps than the 3rd and 4th days. Twice as many flies were caught the 1st two days than the 2nd two days after baiting. Pellets were gummy and coated with exudations after 3-4 days of exposure and crumbled on touch after 4-5 days of exposure.

More flies were caught in WOT's than buckets but this was expected because much less SL is found in pellets than bottles of SL.

Insufficient evidence was obtained to determine a difference in the time of day flies were collected (A.M. vs. P.M.).

In the test run by Methods Development personnel, an average of 2.3 egg masses/pen/day was observed during the SL test indicating that high populations of wild flies were in the area. Very few wild flies were caught in the traps. Nine wild females were caught during the test and all of these were caught in traps baited with SL-ZP-31. Wild males were not caught in this study.

Lower numbers than expected of released and wild flies were caught during this test. This indicated that low survivability of sterile flies was not the sole cause of the observed low numbers (Table 2). Flies dyed green were collected the last day of this study indicating that some released flies were living at least 4 days but the length of survival is currently unknown. Further tests are being conducted to determine survival of released flies in this area.

Samples of Swormlure and SWASS are currently being analyzed by Paul Thompson and Dr. Brown.

Samples of pellets taken from bags at the distribution center in Manzanillo were in good shape. At least 80% of the pellets were whole, at most, 20% were broken (but not in small pieces) and very little dust was collected from 2 bags. Broken pellets were still usable.

The climate of the area during the study was hot and dry (Table 3).

In this test SL-ZP-31 attracted two times more screwworm flies than SL-2. Dr.

Mackley obtained similar results in Tuxtla Gutierrez, Chiapas, Mexico. An additional test is currently being conducted in Manzanillo. Further studies on the east coast of Mexico near Tampico will be desirable. Hopefully enough data will be obtained from four tests (two completed, one underway and one proposed) to enable us to make some recommendations about future utilization of ZP-31.

Test No.	GL-2	GL-2-31	Ratio	Notes
2-1-51	21	25	1.20:1	
2-3-51	20	22	1.10:1	
2-4-51	20	22	1.10:1	
2-7-51	20	22	1.10:1	
2-8-51	20	22	1.10:1	
2-9-51	20	22	1.10:1	
2-10-51	20	22	1.10:1	
2-11-51	20	22	1.10:1	
Total	120	130	1.08:1	

NOTE: Table 14 given on GL-22-31: GL-2

Table 1. The total number of screwworms caught in all traps using SL-2 and SL-ZP-31 and the ratio comparing the two formulations at Manzanillo, Colima, Mexico in early March 1982.

Date	SL-2	SL-ZP-31	Total	Ratio ^a
3-4-82	23	68	91	2.96: 1
3-5-82	31	71	102	2.29: 1
3-6-82	20	27	47	1.35: 1
3-7-82	16	25	41	1.56: 1
3-8-82	8	17	25	2.13: 1
3-9-82	5	10	15	2.00: 1
3-10-82	8	15	23	1.88: 1
3-11-82	2	4	6	2.00: 1
=====				
Total	113	237	350	2.10: 1

^aThis ratio is given as SL-ZP-31: SL-2

Table 2. Summary by days of the number of flies caught in 20 pairs of SWASS kill buckets and 10 Swormlure-baited wind oriented traps at Manzanillo, Colima, Mexico in early March 1982.

Regular Pellet												
Date	Screwworms			A. M.	C. rufifacies	Others	Screwworms			P. M.	C. rufifacies	Others
	♂	♀	Total	C. macellaria			♂	♀	Total	C. macellaria		
3/4	0	3	3	1	0	53	0	0	0	0	3	38
3/5	1	2	3	0	0	45	0	2	2	3	2	32
3/6	1	2	3	0	2	49	1	1	2	4	1	21
3/7	0	3	3	0	0	30	0	1	1	1	0	43
3/8	1	1	2	0	0	20	0	0	0	0	0	7
3/9	1	0	1	1	2	55	0	0	0	1	2	41
3/10	1	1	2	1	3	45	0	0	0	0	0	19
3/11	0	1	1	4	1	21	-	-	-	-	-	-
Total	5	13	18	7	8	318	1	4	5	9	8	201

Table 2. con't.

ZP-31 Pellet												
Date	A. M.			<u>C. macellaria</u>	<u>C. rufifacies</u>	<u>Others</u>	P. M.			<u>C. macellaria</u>	<u>C. rufifacies</u>	<u>Others</u>
	<u>Screwworms</u>						<u>Screwworms</u>					
	♂	♀	Total				♂	♀	Total			
3/4	3	5	8	1	3	46	3	6	9	0	1	49
3/5	2	2	4	1	4	44	1	8	9	5	2	41
3/6	0	1	1	1	0	32	0	1	1	2	1	18
3/7	0	1	1	0	1	20	0	1	1	1	0	19
3/8	0	3	3	3	0	9	0	3	3	9	0	11
3/9	1	0	1	2	0	15	0	4	4	4	2	29
3/10	1	2	3	1	2	35	1	2	3	1	1	6
3/11	0	0	0	1	0	14	-	-	-	-	-	-
Total	7	14	21	10	10	215	5	25	30	22	7	173

Table 2. con't

Regular Swormlure												
Date	A. M.			C. macellaria	C. rufifacies	Others	P. M.			C. macellaria	C. rufifacies	Others
	Screwworms						Screwworms					
	♂	♀	Total				♂	♀	Total			
3/4	3	11	14	0	0	11	1	5	6	0	0	6
3/5	2	8	10	0	0	0	2	14	16	0	0	0
3/6	0	2	2	0	0	0	6	7	13	0	0	0
3/7	0	6	6	0	0	4	1	5	6	0	0	0
3/8	0	1	1	1	0	0	2	3	5	2	0	1
3/9	0	1	1	0	0	0	2	1	3	0	0	0
3/10	0	1	1	0	0	0	2	3	5	0	1	0
3/11	0	1	1	1	0	0	-	-	-	-	-	-
Total	5	31	36	2	0	15	16	38	54	2	1	7

Table 2. con't.

ZP-31 Swormlure												
Date	A. M.			C. macellaria	C. rufifacies	Others	P. M.			C. macellaria	C. rufifacies	Others
	Screwworms						Screwworms					
	♂	♀	Total				♂	♀	Total			
3/4	5	22	27	0	0	15	4	20	24	0	0	2
3/5	2	15	17	0	1	4	3	38	41	0	0	1
3/6	1	7	8	0	0	0	4	13	17	0	1	2
3/7	3	7	10	0	0	0	5	8	13	0	0	2
3/8	0	6	6	0	0	0	1	4	5	3	0	1
3/9	1	0	1	0	0	0	1	3	4	0	0	0
3/10	2	2	4	0	0	0	1	4	5	1	0	2
3/11	2	2	4	4	1	1	-	-	-	-	-	-
Total	16	61	77	4	2	20	19	90	109	4	1	10

Table 3. Daily temperatures recorded at Manzanillo, Colima, Mexico during comparison tests on SL-2 and SL-ZP-31 in early March 1982.

<u>Date</u>	<u>Site 1</u>		<u>Site 21</u>	
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>
3-4-82	85	91	84	96
3-5-82	58	102	62	90
3-6-82	62	90	62	90
3-7-82	60	90	60	88
3-8-82	60	86	62	88
3-9-82	60	90	62	94
3-10-82	64	96	64	94
3-11-82	64	92	62	92

PROTOCOL FOR SWASS EVALUATION

IN WESTERN MEXICO, PHASE III

MARCH 1982

1. Use kill buckets to measure response of sterile and wild flies to samples of "standard pellet" from storage at the distribution center at Manzanillo Airport, and ZP-31 pellets carried from Mission.
2. Use buckets already in place near Manzanillo to continue the direct comparison of the two pellets. Reverse the buckets at each site each day. Check the buckets two times each day and in the same order each time.
3. Use Wind Oriented Traps already in place near Manzanillo. Bait one trap in each pair with SL-ZP-31 and the other with SL-2; reverse the two Swormlures daily. Check WOT's daily. Carry both Swormlures from Mission. Make sure the SL-2 has been analyzed and approved. On arrival at work area, set up 5 bottles of each Swormlure with wick and outdoor exposure (but not in a trap). Stop exposure, cap the bottles, and place in ice chest on following schedule: Day 0, 3, 5, 7, 9, and on return to Mission.
4. When kill buckets and traps are checked, count SW flies and identify by sex and whether they are probably sterile or wild. Save all flies and store in liquid nitrogen.
5. If available, collect larvae from any cases in the area and preserve in liquid nitrogen (this is priority 2; do not invest much time in the effort).
6. Area B at Manzanillo - Contact Jim Bruce and get one of his employees to show you the location of the traps.
7. Check with Dr. Asin and others as you go through Guadalajara. Jim Bruce will probably be in Manzanillo. Leave copy of new protocol with Dr. Asin.
8. Collect samples (6-8 pellets) of SWASS for chemical analysis at Weslaco. Take samples of standard pellets from each bag at the time you open the bag. When you go to distribution center to pick up standard pellets open several bags from bottom of stacks and check for broken pellets and fines. Take samples of SWASS and Swormlure at end of test exposure. Place samples in sealed container in ice chest with dry ice for return to Weslaco. Take samples of pellets each day and place in dry ice.
9. Carry a ultra-violet light from Mission. Determine if flies are marked and what color, every day. Place fresh SWASS and Swormlure in traps on the first day traps are observed and on the 5th and 9th day. Continue checking traps until no marked flies of the 1st release date are obtained for 3 days or for a total of 14 days from the date of the 1st marked release. Make arrangements to obtain dry ice either by bus or from Jim Bruce's personnel. Samples must be kept on dry ice.

DRIVE CAREFULLY!

AVOID NIGHTTIME DRIVING!

PROPOSED PROGRAM REDIRECTIONS

FOR PCO USE ONLY

INSTRUCTIONS:

Forward original and one copy to PCO, PACS, Room 107, Building 005, BARC-West, Beltsville, Maryland 20705. PCO retain original and distribute photocopies of approved requests to PACS Analyst, AA, BFD, DA, and AD/CD.

ID NO.

ORGANIZATION UNITS (Give complete mailing addresses)

Agricultural Products Technology Research
Subtropical Research Laboratory, USDA-ARS
P. O. Box 267
Weslaco, TX 78596

ORGANIZATION/LOCATION CODES (See AM 314-3)

CHANGE TO BE IMPLEMENTED—

- ☒ THIS FISCAL YEAR
☐ NEXT FISCAL YEAR

LIST ALL CHANGE(S) PERTINENT TO THIS REQUEST BY (a) nature of change (add, delete, increase, decrease, etc.), (b) WRU numbers, and abbreviated title if appropriate, and (c) desired changes (+ or - amount and SY's).

- Establish WRU 7304-20480 in the Subtropical Research Laboratory, Agricultural Products Technology Research Unit at Weslaco, TX
- Establish a CRIS work unit (7304-20480-001) at Weslaco, TX entitled "Enhancement of Swormlure-2, SWASS, and Screwworm diets".
- Establish 0.2 SY effort at Weslaco with the initial Funding of \$30,000/annum. To be funded by redirection of funds from WRU 7309-20480, Screwworm Research, Mission, TX.

EXPLANATION OF CHANGE(S) INCLUDING INFORMATION ON REDISTRIBUTION OF FUNDS, SY'S, AND CHANGES IN RESEARCH DIRECTION.

The proposed phasing out of Screwworm Research at Mission, TX, the move of this research to Tuxtla Gutierrez, Chiapas, Mexico, and it not being feasible to hire a chemist and establish an analytical laboratory at this location, along with the continued manufacture of Swormlure-2 and SWASS at Mission, has resulted in a need for chemistry research support of this program to be established at the Agricultural Products Technology Research Unit in Weslaco.. The use of Swormlure-2 and SWASS in tropical areas of Mexico have been less effective than when used in Northern Mexico and Southwestern U. S., therefore, research will be directed to enhance their effectiveness. Furthermore, a continued effort will be directed, when needed, to provide research support for development of screwworm larval and adult diets used in the eradication program. The chemistry support of these phases of research will be conducted in Weslaco, TX and will necessitate the use of 0.2 SY's and \$30,000 to be re-directed from Screwworm Research. Technical Support (Paul E. Thompson, Jr., Physical Science Technician, GS-7) would continue in this program and be funded by Screwworm Research.

RECOMMENDED

AREA/CENTER DIRECTOR (Signature)	DATE	DEPUTY ADMINISTRATOR (Signature)	DATE

OA CONCURRENCES AND APPROVAL

DIRECTOR, PACS (Signature)	DATE	ASSISTANT ADMINISTRATOR (Signature)	DATE
Concurrence:		Concurrence:	
DIRECTOR, BFD (Signature)	DATE	ASSOCIATE ADMINISTRATOR (Signature)	DATE
Concurrence:		Approved:	

RECEIVED APR 8 1982



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 9, 1982

SUBJECT: Transmittal of Report on the SWASS Evaluation in Central Veracruz

TO: Dr. Nazario Pineda V, Director
Dr. Robert Reichard, Acting Co-Director
Comision Mexico-Americana Para
La Eradicacion del Gusano
Barrenador
Leibnitz No. 20 - 12^o Piso
Mexico, D. F. 06000

Enclosed for your information is a copy of a report prepared by John Spencer and René García on the SWASS evaluation conducted jointly by ARS and Methods Development in Veracruz in 1981.

O. H. GRAHAM
Location/Project Leader

cc: J. R. Johnston, AD, College Station
E. L. Kendrick, RA, New Orleans
N. L. Meyer, ADA, Washington, D. C.
F. E. Smith, CSV, Hyattsville
H. C. Hofmann, Ent. Adv., Mexico City
W. H. Sudlow, LD, Mission
H. E. Brown, RL, Weslaco
J. P. Spencer, Res. Ent., Tuxtla Gutierrez

Enclosure

High

Methods and Materials

An area (see Fig 1) bordered by the Rio Atoyac, the Gulf of Mexico, the Michoacán and the Tlaxcala states of Mexico, was selected for study. The area was bounded by the coordinates $19^{\circ} 05' N$ to $19^{\circ} 40' N$ and $98^{\circ} 05' W$ to $98^{\circ} 40' W$. The area is of 2,450 sq km but about 10% was not treated because it was inundated with water. The control area was an area of 100 sq km.

Report on the SWASS Evaluation

Conducted in Central Veracruz Oct 6, 1981 - Jan 4, 1982.

John P. Spencer and René García

In order to assess and monitor the wild fly population, 10 control traps were located in the center of each area in order to monitor the effect of the spraying with DDT. Each of the 10 traps contained 3 sheep, one of which was wounded and artificially infested with 1000 eggs of the fly. The eggs were collected from the wounds daily and the larvae were reared in a laboratory in each of the areas. The larvae were reared in the city of Veracruz and the other in Santiago Tuxtla. When the larvae reached the 3rd instar stage, they were frozen in liquid N₂ for genetic analysis.

Twenty 2-2 traps were located in each area; 5 traps baited with 2-2 and 5 traps baited with 2-2 and 2-3. The 2-2 traps were baited with 2-2 and the 2-3 traps were baited with 2-2 and 2-3. The 2-2 traps were baited with 2-2 and the 2-3 traps were baited with 2-2 and 2-3.

Because of questions that have arisen regarding the effectiveness of SWASS and the screwworm attractant Swormlure-2, a field evaluation of SWASS was initiated on Oct 6, 1981 in Central Veracruz to determine if SWASS was effective in those ^atropical areas of Mexico characterized by high rainfall and relative humidity. In addition, traps baited with Swormlure-2 (SL-2) were compared with traps baited with liver and SWASS pellets.

Methods and Materials

An area (see Fig 1) bordered by the Rio Atoyac, the Gulf of Mexico, the Rio Papaloapan and the foothills of the Sierra Madre Oriental (Coordinates - $19^{\circ} 05'' \times 96^{\circ} 07''$; $18^{\circ} 45'' \times 95^{\circ} 40''$; $18^{\circ} 03'' \times 96^{\circ} 11''$; $18^{\circ} 45'' \times 96^{\circ} 50''$) was selected to be treated. The area is ca 2,450 sq mi but about 10% was not treated because it was inundated with water. The control zone was an area of equivalent size which extended from the Rio Papaloapan down the coast to the municipio of Acayucan (Fig 1).

In order to assess and monitor the wild fly population, 10 sentinel sheep pens were located in each area. The pens were located in the center of each zone in order to minimize the effect of immigrating wild flies. Each of the pens contained 3 sheep, one of which was wounded and artificially infested with screwworm larvae each week. Egg masses ^{were} collected from these wounds twice daily and the masses were reared in mobile laboratories in each of the zones (one mobile lab was located in the city of Veracruz and the other in Santiago Tuxtla). When the larvae reached 3rd instar samples were frozen in liquid N₂ for genetic analysis.

} not a part of the exper

Twenty SL-2 - baited wind oriented traps (WOT's), 5 liver-baited Bishop traps, 5 Bishop traps baited with bottles of SL-2, and 5 Alvarez traps baited with SWASS pellets were located in each area.

The WOT's were checked every 3rd day and the screwworm flies were frozen in N₂. The SL-2 was changed in the WOT's and Bishop traps weekly; the liver was changed in the Bishop traps weekly; and the SWASS in the Alvarez traps was changed 3 times a week.

In order to obtain meteorological data, rain gauges and minimum-maximum thermometers were located on 3 different ranches in each of the 2 areas; and in addition, wet/dry bulb readings were taken daily with sling psychrometers at the same 3 locations for conversion to % relative humidity.

Baseline information was collected Oct 6-26. On Oct 27 SWASS drops began at the rate of 2 lb/mi²/wk on 1 mi swath widths. On Nov 15 the SWASS rate was increased to 4 lb/mi²/wk on 1/2 mi swath widths.

From Nov 28 until Dec 8 part of the area could not be treated because of military exercises.

Results and Discussion

As evidenced in Table 1, a large number of egg masses were collected in both the treated and control zones. By the end of the 3rd week pretreatment collection period, 114 masses had been collected in the zone to receive the SWASS treatment and 78 masses had been collected in the control zone. On Oct 27 the SWASS drops began at the rate of 2 lb/mi²/wk on 1 mi swath widths. However, instead of a reduction in the number of egg masses the number continued to increase until a test high of 190 masses/wk were collected (week of Nov 10-16).

It was during this week that the decision was made to increase the SWASS rate to 4 lb/mi²/wk on 1/2 mi swath widths. It appeared initially that the increase in the SWASS rate resulted in a decrease in the number of egg masses but during the same period following the SWASS increase, the number of egg masses collected in the

control zone also decreased dramatically. It is our opinion that the decrease was a reflection of the natural cycling of the screwworm population.

It is of interest that the test zone consistently produced more egg masses while it consistently registered lower rainfall and lower relative humidity than the control zone (Table 7 and 8). This perhaps supports the observations of Parman (1945) that flies are less active during rainy, cloudy weather.

Adult screwworm captures were very low with every trapping system used. WOT's baited with SL-2 (Table 2) as well as the Bishop traps baited with SL-2 (Table 4) captured disappointingly low numbers of screwworms. Liver baited Bishop traps did no better (Table 3) and Alvarez traps baited with SWASS (Table 5) captured practically nothing.

Table 1. Numbers of egg masses collected from sentinel sheep in central Veracruz during the test period (Oct 6, 1981-Jan 4, 1982).

Wk Beginning	Treated Zone	Control Zone
Oct 6	15	6
13	56	30
20	43	42
27 ^{1/}	95	27
Nov 3	146	47
10 ^{2/}	190	49
17	83	62
24 ^{3/}	82	56
Dec 1	64	37
8	79	7
15	31	6
22	9	6
29	17	23

1/ SWASS drops began on Oct 27 at the rate of 2 lb/mi²/wk on 1 mi swath widths.

2/ The SWASS rate was changed on Nov 15 to 4 lb/mi²/wk on 1/2 mi swath widths.

3/ From Nov 28 until Dec 8 only part of the test zone was treated because of military exercises in the area.

Table 2. Flies captured in SL-2 baited WOT in central Veracruz during the test period (Oct 6, 1981-Jan 4, 1982)

Wk Beginning	<u>Treated Zone</u>			<u>Control Zone</u>		
	♀ SW	♂ SW	Other Diptera	♀ SW	♂ SW	Other Diptera
Oct 6	1	0	1,009	1	0	214
13	4	0	474	1	0	291
20	1	1	556	1	0	547
27 ^{1/}	3	0	851	1	1	410
Nov 3	1	0	449	1	0	329
10	0	0	207	0	0	283
17 ^{2/}	2	1	128	0	0	542
24	7	0	276	5	0	1,559
Dec 1 ^{3/}	61	13	252	0	0	1,842
8	112	1	68	5	0	867
15	13	2	46	1	0	562
22	0	0	52	1	0	311
29	0	0	79	5	0	1,304

^{1/} SWASS drops began on Oct 27 at the rate of 2 lb/mi²/wk on 1 mi swath widths.

^{2/} The SWASS rate was changed on Nov 15 to 4 lb/mi²/wk on 1/2 mi swath widths.

^{3/} Some boxes of sterile flies were erroneously dropped in part of the test zone. *inadvertently?*

Table 3. Flies captured in liver-baited Bishop traps in central Veracruz during test period (Oct 6, 1981-Jan 4, 1982).

Wk Beginning	<u>Treated Zone</u>			<u>Control Zone</u>		
	♀ SW	♂ SW	Other Diptera	♀ SW	♂ SW	Other Diptera
Oct 6	-	-	-	-	-	-
13	-	-	-	-	-	-
20 ^{1/}	0	0	12,444	1	0	2,259
27 ^{2/}	0	0	4,364	0	1	1,079
Nov 3	0	0	2,270	0	0	1,738
10 ^{3/}	0	0	2,020	0	0	898
17	1	0	3,280	0	0	2,485
24	4	0	10,206	0	0	13,425
Dec 1 ^{4/}	5	0	16,662	0	0	26,922
8	3	1	5,713	17	1	23,153
15	0	2	2,340	18	3	7,871
22	12	0	1,442	27	8	11,345
29	2	0	1,119	36	13	21,435

1/ Began checking these traps on Oct. 20.

2/ SWASS drops began on Oct 27 at the rate of 2 lb/mi²/wk on 1 mi swath widths.

3/ The SWASS rate was changed on Nov 15 to 4 lb/mi²/wk on 1/2 mi swath widths.

4/ Some boxes of sterile flies were erroneously dropped in part of the test zone.

Table 4. Flies captured in SL-2-baited Bishop traps in central Veracruz during test period (Oct 6, 1981-Jan 4, 1982).

Wk Beginning	<u>Treated Zone</u>			<u>Control Zone</u>		
	♀ SW	♂ SW	Other Diptera	♀ SW	♂ SW	Other Diptera
Oct 6	-	-	-	-	-	-
13	-	-	-	-	-	-
20 ^{1/}	0	0	964	0	0	384
27 ^{2/}	0	0	1,090	0	0	394
Nov 3	1	0	703	0	0	414
10 ^{3/}	0	0	1,749	0	0	641
17	0	0	1,601	0	0	749
24	0	0	1,810	0	0	1,225
Dec 1 ^{4/}	28	9	3,134	0	0	2,061
8	3	1	2,758	5	1	1,658
15	0	0	685	1	1	740
22	10	7	1,455	0	3	615
29	0	0	664	0	0	1,291

1/ Began checking these traps on Oct 20.

2/ SWASS drops began on Oct 27 at the rate of 2 lb/mi²/wk on 1 mi swath widths.

3/ The SWASS rate was changed on Nov 15 to 4 lb/mi²/wk on 1/2 mi swath widths.

4/ Some boxes of sterile flies were erroneously dropped in part of the test zone.

Table 5. Flies captured in SWASS baited Alvarez traps in central Veracruz during test period (Oct 6, 1981-Jan 4, 1982).

Wk Beginning	<u>Treated Zone</u>			<u>Control Zone</u>		
	♀ SW	♂ SW	Other Diptera	♀ SW	♂ SW	Other Diptera
Oct 6	-	-	-	-	-	-
13	-	-	-	-	-	-
20 ^{1/}	0	0	30	0	0	8
27 ^{2/}	0	0	55	0	0	10
Nov 3	0	0	3	0	0	11
10 ^{3/}	0	0	21	0	0	18
17	0	0	16	0	0	15
24	0	0	100	0	0	36
Dec 1 ^{4/}	0	0	25	0	0	8
8	16	0	9	0	0	12
15	0	0	6	0	0	14
22	0	0	2	0	0	12
29	0	0	40	0	0	16

1/ Began checking these traps on Oct 20.

2/ SWASS drops began Oct 27 at the rate of 2 lb/mi²/wk on 1 mi swath widths.

3/ The SWASS rate was changed on Nov 15 to 4 lb/mi²/wk on 1/2 mi swath widths.

4/ Some boxes of sterile flies were erroneously dropped in part of the test zone.

Table 6: Temperatures ($^{\circ}\text{C}$)¹ from Central Veracruz during the test period (Oct 6 1981- Jan 4 1982)

WK Beginning	Treated Zone		Control Zone	
	Minimum	Maximum	Minimum	Maximum
Oct 6	24.5(23.3-25.5)	37.2(36.0-39.3)	23.8(22.1-26.3)	33.8(32.6-35.5)
13	23.1(21.0-24.5)	34.3(31.5-36.5)	21.6(20.0-24.0)	34.0(32.0-36.0)
20	21.8(20.0-24.0)	30.9(28.0-33.0)	19.7(19.0-20.0)	29.7(27.0-36.0)
27	22.2(19.3-23.6)	31.1(29.0-35.0)	19.2(16.0-21.0)	34.0(30.0-37.0)
Nov 3	21.9(17.6-28.6)	31.3(27.0-34.6)	19.7(16.0-22.0)	31.8(27.0-35.0)
10	17.6(16.0-21.3)	31.1(26.0-36.0)	16.0(12.0-19.0)	32.5(30.0-35.0)
17	17.9(15.0-26.1)	31.6(28.6-34.0)	18.1(15.3-21.6)	30.8(26.0-33.3)
24	17.3(15.2-21.0)	32.0(31.3-33.0)	17.5(11.0-20.0)	35.5(35.5-36.0)
Dec 1	22.6(20.0-24.0)	31.0(28.6-34.0)	20.5(19.0-22.0)	34.7(31.0-38.0)
8	18.4(15.8-20.0)	26.5(22.0-29.6)	19.7(11.0-32.5)	30.7(21.5-35.0)
15	20.2(15.5-24.3)	26.5(21.0-31.5)	20.9(19.0-22.0)	27.7(23.0-34.0)
22	20.7(19.0-24.0)	31.2(27.0-35.0)	20.8(19.0-23.0)	31.1(27.0-33.0)
29	18.5(15.0-23.0)	30.7(27.0-35.0)	20.1(19.0-21.0)	32.1(29.0-34.0)

¹ Avg of daily readings taken in 3 locations in each zone.

Table 7: Weekly rainfall (mm)^{1/} from central Veracruz during the test period (Oct. 6, 1981 - Jan. 4, 1982)

WK Beginning	Treated Zone	Control Zone
Oct 6	1.3	16.47
13	15.5	25.13
20	11.5	73.53
27	7.5	87.33
Nov 3	8.2	47.07
10	16.7	14.33
17	.07	.5
24	0	0
Dec 1	7.7	10.87
8	.8	30.47
15	4.3	31.43
22	0	.9
29	---	---

^{1/} Averages of readings taken in 3 locations in each zone.

Table 8. Percent relative humidity^{1/} from central Veracruz during the test period (Oct 6, 1981-Jan 4, 1982).

Wk Beginning	Treated Zone	Control Zone
Oct 6	-- ^{2/}	79
13	76.2	84
20	75.7	87.7
27	76.3	83
Nov 3	67.8	80.3
10	72.3	78.9
17	63.3	74.7
24	63.9	77.6
Dec 1	75.7	78.5
8	76.4	79.8
15	-- ^{2/}	85
22	-- ^{2/}	81.2
29	-- ^{2/}	

^{1/} Average of readings taken at 3 locations in each zone.

^{2/} Readings not taken.

Because of questions that have arisen regarding the effectiveness of SWASS and the screwworm attractant Swormlure-2, a field evaluation of SWASS was initiated on Oct 6, 1981 in Central Veracruz to determine if SWASS was effective in those tropical areas of Mexico characterized by high rainfall and relative humidity. In addition, traps baited with Swormlure-2 (SL-2) were compared with traps baited with liver and SWASS pellets.

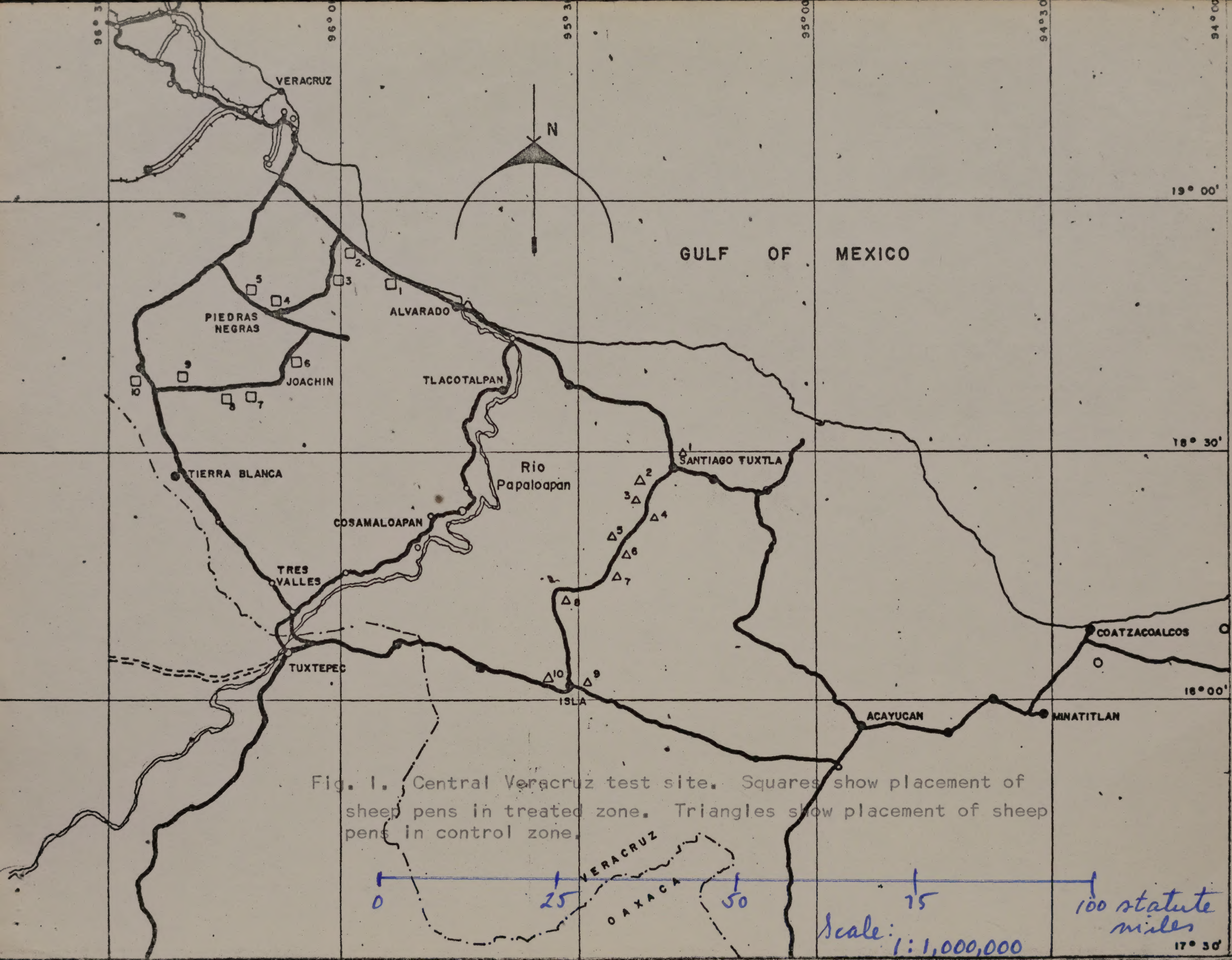
Methods and Materials

An area (see Fig 1) bordered by the Rio Atoyac, the Gulf of Mexico, the Rio Papaloapan and the foothills of the Sierra Madre Oriental (Coordinates - $19^{\circ} 05'' \times 96^{\circ} 07''$; $18^{\circ} 45'' \times 95^{\circ} 40''$; $18^{\circ} 03'' \times 96^{\circ} 11''$; $18^{\circ} 45'' \times 96^{\circ} 50''$) was selected to be treated. The area is ca 2,450 sq mi but about 10% was not treated because it was inundated with water. The control zone was an area of equivalent size which extended from the Rio Papaloapan down the coast to the municipio of Acayucan (Fig 1).

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Twenty SL-2 - baited wind oriented traps (WOT's), 5 liver-baited Bishop traps, 5 Bishop traps baited with bottles of SL-2, and 5 Alvarez traps baited with SWASS pellets were located in each area.

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the survey





United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 9, 1982

Dr. F. C. Alexander
Animal Health Specialist
Inter-American Institute for
Cooperation on Agriculture
Antilles Zone
Box 10 - 1089
Georgetown, Guyana, S.A.

Dear Dr. Alexander:

In response to your cablegram of April 5, I must point out that our capability for involvement in a screwworm program in Guyana has not improved since I wrote to you last August. In fact, our situation has somewhat worsened because we are in the process of closing our research laboratory at Mission, Texas and transferring our scientists to Tuxtla Gutierrez, Chiapas. Our resources are currently inadequate for support of the eradication effort in Mexico and it will be most difficult for us to divert even part of our capability to another region.

In spite of the problems mentioned above we are willing to at least consider sending one entomologist to Guyana for a month. Before travel can actually begin we must obtain a special authorization for foreign travel and we cannot usually obtain such a travel authorization in less than 3-6 months. If you or someone else in IICA will write to me formally requesting the services of one of our entomologists for one month and stating that IICA will pay all of travel costs, we can then request a travel authorization. It would be helpful if you would indicate the date that you would like for the consultancy to begin.

Dr. John P. Spencer, the entomologist I recommend for the mission, has had several years of experience with the laboratory here in Mission and with the research program in Mexico. He is, I believe, unusually well qualified to undertake the tasks outlined in your cablegram.

Sincerely,

O. H. GRAHAM
Location/Project Leader

cc: F. J. Mulhern, Dir., San Jose
N. L. Meyer, ADA, Washington, D. C.
F. E. Smith, CSV, Hyattsville
P. N. Acha, Spe. Adv., Washington, D. C.
J. A. Ferrer, San Jose
J. P. Spencer, Res. Ent., Tuxtla Gutierrez

J. R. Johnston, AD, College Sta.
E. L. Kendrick, RA, New Orleans
R. A. Bram, SS, Beltsville
R. E. Reichard, ACo-Dir., Mex. City
A. A. Arce, Washington, D. C.



United States
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Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 9, 1982

Dr. Wayne Kramer
Associate in Veterinary Medicine
Dept. of Preventive Medicine
Box J-136
University of Florida
Gainesville, Florida 32610

Dear Dr. Kramer:

Thank you for your letter of March 19 and the enclosed SF-171 and curriculum vitae. I presume that you are aware that our laboratory in Mission, Texas will close later this year and that all of the scientists will move to Tuxtla Gutierrez, Chiapas. We do not at present have any vacancies in our group, but anticipate that we will probably have at least one later this year.

If you would like to be considered for employment as a research entomologist at Tuxtla please write and so indicate. Also, please state when you believe you would be available.

The primary duties of the position will be research in behavioral physiology and will include laboratory and field studies of the role of pheromones, wound attractants, and other chemicals in screwworm behavior, especially mating and oviposition behavior.

Sincerely,

O. H. GRAHAM
Location/Project Leader



United States
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Agriculture

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Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 9, 1982

SUBJECT: Annual Research Plan (CY 1982)

TO: Floyd E. Smith, C, SV
USDA, APHIS, VS, AH
Federal Center Building
Hyattsville, MD 20782

As you suggest in your memorandum of March 26, we did not attempt to arrange the items in our plan in a priority order. Our thinking on this subject has not changed and we remain in complete agreement with the priorities established by you and Dr. Bram on Feb. 9, 1982. I might add that our plan is a guide, not a rigid limitation. If unexpected needs arise during the year we would not be excluded from responding to them.

O. H. GRAHAM
Location/Project Leader

cc: R. A. Bram, SS, Beltsville
J. R. Johnston, AD, College Station

Research Priorities for Major APHIS Programs

ARS Staff

APHIS Staff

Date: 2/9/82

Name: R. A. Bram

Name: F. E. Smith

APHIS Program: Screwworm Eradication

Position: NRPL

Position: Chief Staff Veterinarian

Current ARS Research Activities		APHIS Research Needs in Priority Order			
	SY	FY 82	FY 83	FY 84*	Long-Range Goals
1. Strain development	1	1. Strain development	1. Strain development	1. Strain development	1. Strain development
2. SWASS-swormlure enhancement	2	2. SWASS enhancement	2. SWASS enhancement	2. Genetics (population characterization and all male strain)*	2. Ecology in Central America*
3. Genetics (population characterization and sexing)	3	3. Genetics (population characterization)	3. Genetics (population characterization)	3. Ecology in Central America*	3. Ecology in South America*
4. Other attractants	2	4. Ecology in Southern Mexico	4. Ecology in Central America	4. SWASS enhancement	4. Genetics (population characterization all male strain)
5. Field biology and ecology	2	5. Diet improvement	5. Other attractants	5. Other attractants	5. Other attractants
		6. Other attractants	6. All male strain	6. Diet improvement	6. Systemic insecticides
		7. All male strain	7. Diet improvement	7. Systemic insecticides	7. Diet improvement
		8. Systemic insecticides	8. Systemic insecticides		

DRAFT

*Items identified with an asterisk will require budget increases, redirection of resources, or other program adjustment for initiation in FY 84.

DRAFT

Research Priorities for Major APHIS Programs

SCREWORM ERADICATION

FY 82

The highest priority for APHIS in FY 82 and subsequent years is screwworm development. Although no longer a purely research function, it is, nevertheless, of paramount importance to the success of the program and should continue as a cooperative activity between APHIS program personnel and ARS scientists. The second order of priority will remain to be SWASS-swormlure enhancement in humid tropical areas. Genetic population characterization assumes the third order of priority - specific direction of this research will be reassessed following completion of the technical panel study of the possibility of reproductive isolation between screwworm populations. Screwworm ecology in Southern Mexico must continue in advance of the eradication program. Fifth in priority is the improvement of screwworm diet. Other priorities of somewhat equal importance are the development of alternative attractants (both feeding and oviposition attractants), development of an "all male" strain, and the development of systemic insecticides for regulatory use.

FY 83

The first three priorities of FY 82 (strain development, SWASS enhancement, and genetics) remain unchanged for FY 83. Ecological research should begin to advance into Central America. The importance of developing alternative attractants should advance to fifth priority. Research should continue on development of an "all male" strain, diet improvement, and systemic insecticides for regulatory use.

FY 84

Strain development continues as the first priority. Assuming that the question of SWASS effectiveness in the humid tropics has by now been resolved, research on insect genetics (including development of an "all male" strain must now assume greater prominence with a budget increase of \$250,000 divided between the Fargo and Tuxtla Gutierrez locations. By now, a major effort, which will require a budget increase of \$250,000 by the Tuxtla Gutierrez location, will be required to intensively study screwworm ecology in Central America. A significant research effort must be maintained for SWASS enhancement, alternative attractants, diet improvement, and systemic insecticides for regulatory use.

Long-Range Goals

With the long-term objective of extending screwworm eradication through Central America in mind, ecological and biological research, as well as genetic characterization of screwworm populations, are of high priority importance. The development of an "all male" strain must continue to receive research priority because of its potential of reducing the cost of maintaining a barrier zone. Continuing efforts will be necessary to improve diet, develop alternative attractants, and develop systemic insecticides for regulatory use.

DRAFT



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Office of the
Regional Administrator

701 Loyola Avenue
P.O. Box 53326
New Orleans, Louisiana
70153

April 9, 1982

SUBJECT: Plans for Keeping Tuxtla Staffed

TO: J. R. Johnston
College Station, Texas

Dr. Graham's March 18, 1982 memo gives us good lead time on needed replacements of our Tuxtla screwworm staff. As we all know, these positions at Tuxtla are not easy to fill. It will be primarily Ralph Bram, Hugh Graham and Bob Hoffman who will have to beat the bushes to find replacement candidates. I pledge the support and cooperation of our PPR and Personnel staffs to work closely with your office in every effort to keep the Tuxtla program fully staffed.

E. L. KENDRICK
Regional Administrator

cc:

M. Frere

R. Bram

G. Graham ✓

J. Barry

see complete file in
CORRESPONDENCE, 1982- APRIL-
JULY

RECEIVED APR 14 1982



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region

U. S. Livestock Insects Laboratory
P. O. Box 232
Kerrville, TX 78028

April 12, 1982

SUBJECT: Information from Dr. G. E. Moya Borja

TO: O. H. Graham, Location Leader/Project Leader
Screwworm Research Laboratory
Mission, TX

Reference is made to a copy of your letter of April 7 to Dr. Moya Borja. I am enclosing a copy of a letter I sent him last October indicating my interest in attending a subject seminar in Brazil. You will note in that letter I gave him details as to how it might be possible for me to attend. Your letter is the first I have heard since then about the subject course. It seems to me that the only way I could go would be for him to pay travel.

I find it unfortunate that I have not received any additional information. If you could send me a copy of the program that you have received, I would be grateful.

R. O. DRUMMOND
Laboratory Director

Enclosure

cc:
J. R. Johnston, OTA

*see complete file in:
CORRESPONDENCE, 1982 - APRIL -
JUNE*

04/13/82

Novy

1. U-81 (vs.) arriaga

2. powdered egg -

old, weevil infested

BROWN

EL VERDE

LA Pesca

Soto

Sincerely,

Wayne Kramer

Wayne L. Kramer
Associate in Veterinary Medicine

RECEIVED APR 1 9 1982



DEPARTMENT OF PREVENTIVE MEDICINE
BOX J-136
UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA 32610

PHONE RESPONSE TO: ☐ 904 392-1841
☒ 904 392-4756
☐ 904 392-4741

COLLEGE OF VETERINARY MEDICINE
J. HILLIS MILLER HEALTH CENTER
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

April 13, 1982

Dr. O. H. Graham
Location Leader
Screwworm Research
P. O. Box 986
Mission, Texas 78572

Dear Dr. Graham:

Thank you for your letter of April 9, 1982 informing me of the current employment outlook at the Screwworm Research facility.

I was aware that all of the future work would be conducted at the new facility in Tuxtla. I am still most interested in the position (behavioral physiology) that may open later this year and would very much like to be considered for this position. In this regard, I am also sending my application materials into Hyattsville for the USDA research entomologist (Ann. 421-2-0055) position at Tuxtla which has been advertised on the April federal employment listing. I am not sure if this is the position you referred to in your letter or a different position.

This area of behavioral ecology is of special interest to me since my dissertation work at UC Riverside dealt with the chemical ecology of oviposition in mosquitoes.

My present postdoctoral research will probably terminate between July and September of this year but this date is somewhat flexible. I would be available sometime after July 1 if a position were to be offered to me.

Thank you for your consideration and I shall look forward to hearing from you in the future.

Sincerely,

Wayne Kramer

Wayne L. Kramer
Associate in Veterinary Medicine

WLK:jgc

Dr. Brenner

RECEIVED APR 28 1982

Donald Hopkins To
Rick Brenner

April 14, 1982.

Rick:

Last Wed. I received the plans for the test.

As you noted in your letter, it seems certain that we will ultimately need to adjust the plans. Roads aren't situated so - that pens, release points, and traps can be placed regularly, - and yet allow pens to be located so that all wounds could be - conveniently and rapidly inspected twice daily.

The most critical elements of the plan for comparing strains are that a measurable rate of sterility be created, and created in a repeatable way. The potential for repeatability is what - makes the test worth doing.

So -- if we execute the test of strains with regularly or irregularly placed pens and release points, and yet create and measure sterility by ways we can repeat we can be successful.

It may even be that rigid placement of pens, release points, and traps is actually an anthropomorphic approach; topography - and vegetation in the area are not regular, and have largely - unknown, but surely definite, influences on dispersal and migration - so striving for a preconceived regularity of placement, - when placement may be largely incidental, may not be important - (strategic placement if we knew correct strategy, would perhaps be more important than regularity).

We need only to be very strict about the following:

- (1) describing the prevailing climatic conditions,
- (2) being consistent in the use of techniques, and
- (3) describing exactly what we observe by the use of those standard techniques.

We can run some risks. The potential contribution of definitive data to the aspects we are investigating makes risks - worth taking.

Sincerely.

DON.



United States
Department of
Agriculture

Agricultural
Research
Service

National
Program
Staff

Braham
Beltsville, Maryland
20705

RECEIVED APR 26 1982

April 20, 1982

SUBJECT: Slides of Research Activities

TO: LD's, RL's, and PL's, NRP 20480 and NRP 20850

Occasionally, we receive short-notice requests for good 2 x 2 slides illustrating research facilities, research activities, and significant research accomplishments. These are used by program and administrative personnel in general talks to constituent groups, at national meetings, and for a variety of other purposes. In order to assure that the noteworthy accomplishments of research scientists in insects affecting man and animals are not overlooked, it would be extremely helpful to have current and suitable slides readily available.

I, therefore, wish to request that, at your convenience, you provide me with 2 x 2 slides which illustrate the most important work in which your Research Unit is engaged. With each slide, please include two or three sentences describing the facility, activity, or research accomplishment and identifying individuals where appropriate. These will be maintained in your Research Unit folder for ready retrieval when the need arises. Thank you for your thoughtful consideration of this request.

RALPH A. BRAM
National Research Program Leader
Insects Affecting Man & Animals



United States
Department of
Agriculture

Science and
Education
Administration

Agricultural Research
North Central Region
Metabolism and
Radiation Research
Laboratory

P.O. Box 5674
State University Station
Fargo, North Dakota
58105

RECEIVED APR 26 1982

INFORMATION COPY

April 21, 1982

SUBJECT: Screwworm Fly Research Evaluation Panel - Mission and Austin, Texas

TO: L. E. LaChance

During a research telecon this morning (21 April) Dr. O. H. Graham expressed his appreciation for the excellent job that you performed in organizing the Screwworm Fly Research Review Panel that met in Mission and Austin, Texas, during the week of 4 April. Dr. Graham was impressed with the competence of the panel members and the intensity that they applied to the task.

Thanks for undertaking a very difficult task, Leo.

GEORGE GASSNER
Research Leader
Insect Genetics and Cell Biology

cc: C. H. Schmidt
K. Lebsock
P. Fitzgerald
T. Kinney
R. Bram
W. Klassen



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 21, 1982

SUBJECT: Employment of Research Entomologist

TO: J. R. Johnston, Area Director
USDA, ARS, SR
Oklahoma-Texas Area
P. O. Box EC
College Station, TX 77841

Of the several applications for employment I have received, one from Dr. Wayne Kramer is especially impressive. We need to strengthen our research on the behavior of wild screwworm flies as it is influenced by chemical cues. It appears that Dr. Kramer would be unusually well qualified to carry out this type of research but we cannot presently fill vacancies because of insufficient FY 1982 funds. Is there any chance of obtaining supplemental funds? If some of our more experienced researchers move into the proposed Caribbean or Central American programs it will be very important that we have new people on the job in Tuxtla for a few months (or at the least, a few weeks) before the experienced persons leave Tuxtla.

O. H. GRAHAM

Location/Project Leader

Enclosures: Copy of Kramer letter 4/13/82
" " " curriculum vitae

cc: R. A. Bram, SS, Beltsville



United States
Department of
Agriculture

Animal and
Plant Health
Inspection Service

Veterinary
Services

RECEIVED APR 27 1982
National Veterinary Services Laboratories
P. O. Box 844
Ames, Iowa 50010

April 21, 1982

Dr. H. Chris Hofmann
Head, Methods Development
Comision Mexico - Americana para la
Erradicacion del Gusano Barrenador
Leibnitz 20 - piso 12
Apdo. Post. M - 2890
Mexico D.F. 06000

Dear Chris:

With my return to Iowa, I have been able to go over the data collected from the Manzanillo and Cihuatlan areas of Jalisco, Mexico. As we discussed during your visit to the test area on April 1, 1982, the trap catches appeared to be very low, considering the amount of sterile flies being dispersed. Although we did sample sterile flies throughout the three-week period, the trap catches were only two to three flies per trap per day. The increase in sterile egg masses from the sheep pens in the area would indicate ample sterile flies in the area; the results of trapping would not support the same conclusion.

Traps were set out in a line north, south and west of Cihuatlan. Mr. James Bruce had established a seven-trap line in the area prior to my arrival in Mexico. He also had established sheep pens for the collection of egg masses in the same area. I took over the seven traps and placed another twelve traps in the area. Mr. Bruce maintained surveillance on the sheep pens. From discussions with A.R.S. trappers, as well as from personal experience and observations, it was noted that the Standard Kill Bucket, baited with two SWASS pellets, often did not retain flies that were attracted to the trap and sampled the pellet. From personal observation in the field, it was found that many flies attracted by the SWASS would escape from the confines of the bucket only to die in the immediate area of the trap. Such flies would be lost from the sample, which was collected daily from the trap. To base the effectiveness of SWASS using the catch in the Kill bucket would consistently give a lower score than actually would be the case. We designed a test in which we compared the number of flies captured in two different type traps, utilizing two pellet SWASS as the attractant in both traps. A Standard Kill Bucket and a wind orientated trap (WOT) fitted to hold two SWASS pellets on the inside, near the center of the back screen, were positioned in the trap site locations. The two traps were separated by 125 yards, and the location of each trap was rotated daily. This was done to alleviate the possibility of one trap location being superior to

the other. Eight such traps were placed in the field in four separate locations. The data collected show that the WOT fitted with two pellet SWASS collected 6.5 times the number of the Screw Worm (SW) as did the Kill bucket. If we compare Total flies collected in the two type traps, the WOT collected two times more total flies than the Kill bucket. Most of the other flies collected used in the Total figure were Sarcophagids. All SWASS used in this test was collected from sealed bags from the refrigerator unit at the Manzanillo airport. The pellets used were hand selected for optimum size and were taken from the freshest material at the airport. The pellets used were 16 to 23 days post bagging. This was derived from the date stamped on the bag. For the test, the SWASS was changed every fourth day.

On April 3, 1982, we made three point releases of sterile SW flies. Three sites were selected for the point release. In each of the three sites we positioned three traps: one Kill bucket trap with two pellet SWASS attractant, one WOT baited with two SWASS pellets, and one WOT baited with Swormlure (SL). The test sites were within the trap line we were checking daily, and there were WOT's baited with SL one and two miles on either side of the point release site. The flies used for the point release were delivered from Guadalajara and had been dyed with a fluorescent dye. The packaged flies had pupated March 24, 1982, been irradiated March 29, 1982, and were packaged April 2, 1982. Three dye colors, Red, Green, and Yellow, were used. Two boxes of an individual color were released 100 yards from the three traps at the release site, in each of the three test areas. After the release, the boxes were held and the number of flies released was determined by actual counts of pupal shells. The three traps at the test site were rotated daily, the SWASS changed every fourth day, and the one bottle cotton wick Swormlure changed every five days. The daily collection of flies was held and viewed using an ultra-violet lamp to determine if dyed flies were present. Actual fly releases were: Red 2115, Green 2270, and Yellow 2475. We trapped back a total of 104 colored flies for 1.5 percent of those released. All three colors were sampled, although no colored flies were taken after the seventh day after release. With the exception of one Green fly taken four days after release two miles from the release site, all other colored flies were taken from the traps which were 100 yards from the release point.

We also set up longevity cages in the three test areas. Twenty-five flies of each of the three color groups were placed in screen cages and provided with water and Karo syrup. These cages were hung in shaded areas within the test zone. After ten days we experienced ten percent mortality. The remaining flies appeared active and healthy.

The area of the test appeared to have a high native population of SW flies. In our traps we sampled thirteen female and three male fertile flies. The females taken were all early ovarian development stage, less than three. I personally observed and treated fifteen wormy sheep from a ranch near Cihautlan. This rancher had suffered considerable loss of previously healthy animals to SW after he had docked the animals. Egg masses and worms in

all stages of development as well as adult flies were observed. The poor response to the SL-baited traps by the sterile flies may indicate problems, be it the SL or the ability of the fly to orientate to the trap, I do not know. Sterile fly release in the test area of 5000 per square mile should have yielded great numbers in the traps. The SWASS pellets used appeared to lose the odor of SL very fast. After two days the odor of SL had disappeared and could not be detected, even at very close ranges. At four days the pellets appeared dry and cracked and were crumbly. The seasonal condition in the area was dry. No rainfall occurred during the time I was on the coast. In the morning it was common to see dew collected on the grass and vegetation in the test area, and the temperatures fluctuated between 72° F. at night and 87° F. during the day. The humidity ranged from 72 percent to 86 percent.

The followup of a test utilizing a so-called "perfect" SWASS pellet would be very interesting. I do believe that the morning dew would be enough to seriously hamper the effectiveness of any SWASS pellet on the ground. I would suggest that the use of WOT with SWASS pellets be used in place of the Kill Bucket to give a more accurate estimate of the effectiveness of the pellet. Although there was a good deal of difference in the size of the wild vs. the sterile SW fly, I do believe, based on the longevity in the field cages that this sterile fly has merit. The great numbers of Sarco's collected in the traps may indicate that the SL formulation may have been altered. It is interesting to note from the catches in the Kill Bucket that apparently the "trash" flies are not able to escape the confines of the trap as well as the SW's in the area. Another interesting observation concerning the wild flies collected was that all wild females and males, with the exception of one female, were alive inside the trap at the time of collection. Of the thirteen females and three males trapped, six females and three males were taken in the SL-baited WOT trap. The one dead female was taken from a WOT, SL baited. The remaining seven females were trapped in a WOT trap baited with two pellet SWASS. Even though the flies had total access to the pellets inside the trap, they were very much alive and active, while other sterile SW's and Sarco's in the trap were dead. Of the seven females trapped with SWASS, three were in a trap with pellets that had been changed the previous day; the remaining four were in a trap with pellets that had been changed two days prior. It was apparent that the pellet was strong enough to attract a wild fly into the trap, but it was disconcerting to see how active the flies were even though they were in very close proximity to the pellets.

Thank you for your help during this test. I would also like to specifically thank Mr. Lizandro Gonzales and Mr. James Bruce for their technical support.

Sincerely,

R D Richard

R. D. Richard, Entomologist
General Pathology and
Parasitology Section
Pathobiology Laboratory

cc:

N. L. Meyer, VS, ADA/IP, Hyattsville, MD
D. R. Cassidy, VS, NVSL/PL, Ames, IA



United States
Department of
Agriculture

Science and
Education
Administration

Agricultural Research
Northeastern Region
Office of the
Regional Administrator

Beltsville, Maryland
20705

April 16, 1982

SUBJECT: Long, Long-Range Plan for Research and Diagnosis
on Foreign Animal Diseases and Arthropods

TO: ^{T. L.} ~~L. E.~~ Barber T. E. Walton
R. A. Bram R. O. Drummond
K. L. Kuttler O. H. Graham ✓
J. J. Callis C. J. Whitten
C. W. Beard

Dr. Kinney has asked me to work with Dr. Kenneth R. Hook to develop a study on long, long-range plans for Foreign Animal Diseases and Arthropods for ARS and APHIS. The enclosed is an initial outline.

This is to request that you review the enclosed and provide Drs. Bram and Barber and me with your comments within a week after receiving this memo. Please keep in touch with Drs. Bram and Barber if you have additional ideas after your initial response.

H. GRAHAM PURCHASE
Acting Associate Regional Administrator
for Agricultural Research Service

Enclosure

cc:

G. E. Vanden Berg
H C Cox
P. J. Fitzgerald
E. L. Kendrick
T. J. Army
R. J. Gerrits
D. E. Zimmer
J. M. Vetterling
J. R. Johnston
C. H. Schmidt
N. I. James
W. Thrush
K. R. Hook
J. Espenschade

A Long, Long-Range Plan for Foreign Animal Disease and Parasites Diagnosis and Research

Issue

A U.S. Department of Agriculture policy decision needs to be made concerning current and future diagnosis and research on Foreign Animal Diseases and Arthropods (FAD&A). Before a decision can be reached, Department officials need to identify specific areas of current or planned research and diagnosis that must, by their nature, be continued. They must also identify where the research should be done and with what resources.

Background and Justification

1. As the Animal and Plant Health Inspection Program (APHIS) eradication programs progress, more and more diseases and parasites will be considered exotic. APHIS programs will change in emphasis as new programs are added and old ones are terminated. Also there may be significant changes in the worldwide prevalence of FAD&A and of the potential threat of the introduction of the FAD&A to the United States. The Agricultural Research Service (ARS) has a major responsibility to be responsive to APHIS for both research and diagnosis of FAD&A. It would therefore be appropriate to evaluate the long-range needs of APHIS and to determine how they can best be addressed by ARS.

2. The technology or "state-of-the-art" for diagnosis, prevention of entry, and eradication (stampout vs. vaccination) will change. Recombinant DNA technology will alter vaccination and diagnostic practices. Competence in diagnosis needs to be continually improved and updated. Techniques for the diagnosis of "new" diseases or diseases which increase in prevalence and threat to the United States need to be developed. It is important to develop long-range plans to meet these needs.

3. Facilities for foreign animal disease research are "state-of-the-art" when constructed; however, periodic renovation is necessary and as technology for biological containment advances, consideration must be given to updating the facility design. Thus, it has been hypothesized that because of the inherent dangers to the livestock industry of the United States presented by an infectious and contagious foreign animal disease, there is a need to provide maximum biological containment that can only be provided by an island facility. A reevaluation of this hypothesis and its legal implications is necessary. Factors such as a) the cost of operating an island facility

with its own transportation, fire and police protection requirements, and
b) the distance of an island facility from outstanding academic institutions with resulting lack of cultural and intellectual stimulus must be balanced against the advantages to biological security.

4. Changes have occurred in the availability and cost of energy. Major rehabilitation of current facilities or construction of new facilities would allow for installation of new energy saving technology. The saving in energy cost must be related to the future cost of operating and maintaining the current facilities.

5. Consideration must be given to the long-term need for research facilities already constructed at Plum Island, New York; Athens, Georgia; Pullman, Washington; Denver, Colorado; and Fargo, North Dakota. Proposed construction at Pullman, Washington; Ft. Collins, Colorado; and the use of the partially constructed vaccine facility at Plum Island must also be evaluated. Consideration must also be given to diagnostic facilities at Ames, Iowa, and Plum Island, New York.

6. Currently, animal germplasm important to animal agriculture is imported through several quarantine stations. Future technology may involve importation of embryos. Even with this new technology, there may continue to be needs to import animals for zoological parks. The needs for diagnostic services for FAD&A for these purposes must be evaluated.

7. There may be significant changes in farming practices which will result in a greater or lesser concern for the introduction of FAD&A. It would be appropriate to evaluate these changes.

Charge to Contractor

1. The time projection for the plan should be approximately 25 years (i.e., it should be projected for the year 2010 AD).

2. The scope of the plan should include all foreign animal diseases including bacterial, fungal, viral, and hemoprotozoan diseases, and zoonoses. It should also include arthropods such as ticks and screwworms. The major emphasis should be on research and diagnosis. It should consider personnel, facilities, equipment, and funding in response to program needs.

3. The state-of-the-art should be projected to the year 2010 AD for diseases eradicated; international disease situations; state of technology for diagnosis and control; state-of-the-art for biological containment equipment and facilities; economy of operation in an environment of constraints on energy, budget, and personnel; and the state of the present facilities by that time.

4. The study must be in the context of the mission and role of Federal agencies in the United States. The study should concentrate on how the Federal agencies can best perform their function without taking over from industry or doing what industry could do. For example, the Government should be responsible for the testing of imported animals and imported pathogens and vectors for the presence of foreign animal diseases. The role of the Federal Government in providing service to the industry should also be considered.

5. The study would determine the need for Federal research and diagnosis and how that need can best be addressed. *Contractor would identify and hire Study Group members, and ensure report is in on time.*

Representation on the Study Group

A small study group of 5 or 6 people is recommended. There should be represented among the group (one person may have more than one expertise or viewpoint):

1. Expertise on foreign animal diseases
2. Expertise on arthropods
3. Expertise on biological security
4. Expertise on research
5. Expertise on disease control
6. A Federal viewpoint
7. A State viewpoint
8. A public viewpoint

The group should include representatives from the Secretary's Advisory Committee on Foreign Animal Diseases and the animal production industry. They should not be drawn from the Federal laboratories currently involved in research and diagnosis of FAD&A.

The following resources should be contacted: Department of Defense; Public Health Service; APHIS; ARS; U.S. Animal Health Association; industry associations for horses, poultry, dairy, beef, and swine; and professional associations for animal production and disease control.

Cost

1. Six people for 2 months full time represents 2 SY's or \$100,000.
2. Travel will include visits to PIADC, Greenport, New York; Arthropod Animal Disease Research Laboratory, Denver, Colorado; and Metabolism and Radiation Research Laboratory, Fargo, North Dakota. Possible additional visits would be to Poultry Research Laboratory, Athens, Georgia; and Hemoprotozoan Diseases Laboratory, Pullman, Washington. Estimated cost is \$30,000.
3. Secretarial help and administrative overhead estimated cost is \$20,000.
4. Thus, the estimated total cost would be \$150,000.

Time Frame

1. April 1982 will involve drafting and approval of plan of work.
2. May 1982 will involve preparation of the contract.
3. June 1982 will involve letting of the contract.
4. July 1-December 31, 1982, will involve execution of the plan of work.
5. December 31, 1982, submission of final report.

Justification for Going Contract Route

1. This procedure would be resource effective in that it would save personnel slots.
2. If executed through a contract, the study would be more independent, particularly if the contractor selected the work group. Even greater impartiality would be provided if none of the study group came from the laboratories currently involved in FAD&A research and diagnosis.
3. A contractor with experience could perform such a study better than people inhouse.
4. Suggested contractors (include the National Academy of Science; Booz, Allen, and Hamilton; Mitre; and Battell)



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 22, 1982

SUBJECT: Long, Long-Range Plan for Research and Diagnosis on Foreign
Animal Diseases and Arthropods

TO: H. Graham Purchase
Staff Scientist
USDA, ARS, NPS, LVS
B-005, BARC-W
Beltsville, Maryland 20705

A response to your memo of April 16 on this subject is relatively simple if one considers only the screwworm and assumes that the pest will have been eradicated from the U.S. and Mexico north of Tehuantepec by October 1984. After eradication the USDA will have three major interests:

- (1) Protection of the eradicated region from reinfestation,
- (2) Strengthening the degree of protection by eradicating the screwworm from Central America, and
- (3) An academic interest in eradication of the species from South America, which is to say, worldwide.

The requirements for technological advances vary from slight for Item 1 to moderate for Item 2 to tremendous for Item 3. Those requirements are briefly outlined below.

1. To protect clean areas from reinfestation animal health officials will need:
 - a. Improved procedures for detecting very tiny screwworm infestations in livestock and other warm-blooded animals moving from infested areas, and
 - b. Improved systemic insecticides which will fully protect potential hosts from screwworm infestation.
2. A Central American eradication program should be preceded by and supported throughout its duration by a well organized research program. The research can be modeled after the ongoing Mexican program, but should be designed to provide the information required to eradicate with maximum efficiency and economy. Expertise will be needed in the following entomological specialties:
 - a. Basic biology, bionomics, and population dynamics,
 - b. Ecology, including seasonal and regional incidence, effects of climate and vegetation, host range, and interactions with other organisms,
 - c. Genetics, including chromosomal studies, isozyme characterizations, the genetics of colonized strains and searches for reproductive isolation,
 - d. Physiology, including nutrition, biochemistry, pheromones, and other chemical factors and their influence on the longevity,

vigor, sexual aggressiveness and dispersion of sterile flies, and
e. Control, including chemical and biological control measures and
the integration of screwworm control with other programs such
as tick control.

3. At this time it appears that the eradication of the screwworm from South America would not be technically or economically feasible. Nevertheless, we must consider the possibility that dramatic breakthroughs in pest control technology may occur in 10 or 20 years which would change this assessment. Also, if the jungles of South America are entirely converted to agriculture or other uses, the feasibility of screwworm eradication would need to be reassessed.

In the above discussion I have not considered the Old World Screwworm, Chrysomya bezziana. Certainly we need to protect the New World, especially the Pacific Islands, from this pest. Additionally, much of the technology for screwworm eradication developed by USDA is potentially applicable to the other species and should be made available to other countries through appropriate foreign assistance programs.

O. H. Graham

O. H. GRAHAM

Location/Project Leader

cc: J. R. Johnston, AD, College Station
R. A. Bram, SS, Beltsville
C. J. Whitten, Res. Ent., Fargo



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

Screwworm Research
P. O. Box 986
Mission, TX 78572

April 22, 1982

SUBJECT: Screwworm Quarantines

TO: R. A. Bram, Staff Scientist
Insects Affecting Man & Animals
USDA, ARS, National Program Staff
Rm. 325, Bldg. 005
ARC-West
Beltsville, MD 20705

After reading your copy of my memo to Dr. Purchase you may wonder if I have underestimated the problems of protecting eradicated zones from reinfestation by screwworms. In my opinion, it will be relatively easy to protect the U.S. from screwworm introduction when the pest has been eradicated from Mexico and Central America. Relatively easy, that is, in comparison with other organisms. In spite of a great deal of speculation in the past about screwworm adults being carried long distances by upper air currents or hitchhiking in motor vehicles and airplanes, experience in Curacao, Florida and the Southwest indicates that only rarely do screwworms move long distances other than by the transport of infested domestic animals and the natural flight of mated females.

Almost certainly Curacao was reinfested because cattle on the hoof were being imported from the South American mainland for slaughter on the island without inspecting or treating them. While other blowflies readily move internationally in infested meat products, screwworms do not.

O. H. GRAHAM
Location/Project Leader

cc: J. R. Johnston, AD, College Station

This item has been digitized as a selection from the Screwworm Eradication Collection.

Digital Item Number: 00305

Format: Memorandum copy

Additional Format:

Author:

Additional Authors:

Recipient: Norvan L. Meyer

Date: 22 April 1982

Proper Use of SWASS in Mexico

Note:

Screwworm Eradication Records

Screwworm Eradication Collection

Special Collections, National Agricultural Library



United States
Department of
Agriculture

Agricultural
Research
Service

Southern Region
Oklahoma-Texas Area

O. H. Graham
Screwworm Research
P. O. Box 986
Mission, TX 78572

April 22, 1982

SUBJECT: Proper Use of SWASS in Mexico

TO: Dr. Norvan L. Meyer
Asst. Deputy Admn.
International Programs
USDA, APHIS, VS
Adm. Bldg. Rm. 317-E
Washington, D. C. 20250

Thank you for sending me a copy of your memo to Dr. Reichard dated April 14. Like you, I feel that Mr. Hopkins has justification for being concerned about the effectiveness of SWASS in Mexico and especially about some of the actual uses of SWASS during the past 12 months. However, I also feel that the statement in his memo of Jan. 27, "The use of SWASS is being uselessly, expensively, and dangerously abused," is an overly dramatic statement of opinion not supported by any factual study. This does not negate the probable correctness of other statements in the same memo; the only one of these with which I disagree is the statement that exposure to SWASS will induce insecticide resistance in Mexican screwworms. Significant levels of resistance are extremely unlikely to occur for two reasons: (1) few, if any screwworm adults survive after feeding on a SWASS pellet, and (2) exposure to sub-lethal doses of insecticide would have to be maintained more or less continuously for several generations (probably 20 or more), an extremely unlikely event in the case of screwworms. You probably remember that Dr. Sam Rawlins searched diligently for naturally occurring insecticide resistance for almost 3 years with very little success.

More importantly than the above, if SWASS has not been cost effective during recent periods of heavy use in Mexico, what can you in the action program and we in research do to improve its effectiveness? I have talked about this quite a bit recently with Harold Brown, Jim Mackley, and other ARS personnel, and with Chris Hofmann, Jim Bruce, and Bob Reichard of APHIS. Since they may not all agree with all that follows I accept responsibility for the comments and recommendations in this memo even though I have used their ideas and opinions.

Mexico is so large and varied that generalizations about its ecology are dangerous but there are some aspects of SWASS usage and characteristics of SWASS itself that should be kept in mind when recommendations are prepared. For instance,

- (1) SWASS, true to its name, is a population suppressant, not an eradication technique. Like most synthetic pesticides, it is most cost-efficient when populations are high and becomes progressively less efficient as populations decline. For maximum economy it should ordinarily be used immediately before sterile fly release and not concurrently with sterile flies. This is not to say that the two systems are totally incompatible; since 4X more screwworm females than males typically respond to swormlure, the two can be used together if cost is not an overriding consideration.

- (2) The available information indicates that we can expect SWASS to be highly uneconomic when used for long periods of time in problem areas with low level populations which are difficult to eradicate. Money spent on SWASS in areas of this kind would probably be better utilized if spent for more inspectors, more sprays and dusts (conventional insecticides), more education and PR, and more and better sterile flies.
- (3) Almost certainly some combinations of terrain, climate, and vegetative cover are highly unfavorable to SWASS usage. Obviously if a pellet drops in a puddle, pool, or swamp, it is lost. With less certainty we can presume that pellets which drop in dense vegetation (tall grass, wet grass, dense jungle, etc.) are also lost. Similarly, pellets which drop on wet dirt probably have a very short life. If there is zero air movement (as we observed on 3 consecutive days in Costa Rica) the pellet does not release an odor plume which will attract flies. Other environmental factors probably diminish the effectiveness of SWASS under ecological conditions which have not been studied or defined by either of our organizations.
- (4) Swormlure-2 can probably be improved. In fact, field evaluations which are nearing completion indicate that another formulation, ZP-31, attracts about 2X more (sterile) screwworms than SL-2. We will probably soon recommend that you change to ZP-31, but we regard this as only a first step in the swormlure enhancement research. There is hope that other variants of swormlure will be better suited for specific regions of Mexico than anything developed to date. The pellet itself can probably also be improved to extend its life and increase the areas in which it will be effective.

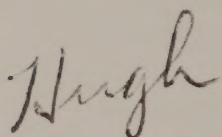
In spite of the time we are spending on swormlure, we regard all research on swormlure as a stopgap effort; something of value that can be done fairly quickly. We do not believe that it will ever be possible to improve Swormlure to the point that it will be the ultimate attractant. An attractant that simulates the attractant in wounds is much more likely to fulfill your long term needs, but the wound attractant may be like a cure for cancer--extremely difficult to define and place in use.

The immediate problem then is how can SWASS best be used in 1982. I believe that the cost effectiveness of SWASS can be improved by making better use of the skills of the regional epidemiologists (fully coordinated of course by Field Operations in Mexico City). With possibly some additional training in the theory and practice of using SWASS and by continuously surveying the climate and vegetation, and by bioassaying SWASS pellets in a specific zone (with the help of Methods Development) before a SWASS grid is laid on a zone, the epidemiologists should be able to prepare sound recommendations for using or not using SWASS. Perhaps better use can be made of modern techniques of aerial and satellite photography (LANDSAT?) when plans for SWASS use are being prepared.

Some changes in the supply and distribution system may be needed so that Regional Directors will not feel pressured to use SWASS merely because X tons of a perishable product are in storage at their distribution centers. It would be

an improvement if most of the onhand supply were stored at Mission or some other central point and the distribution centers did not have to store more than a 1-2 weeks supply. This adjustment will add to management problems at Mission which would then have to vary production up and down each week according to need rather than maintaining a steady production, but substantial dollar savings should result.

I recommend that APHIS and the Commission form a study group to prepare guidelines for the use of SWASS. It appears that under many program conditions SWASS should not be used at all and under other conditions you should continue to use it, but with carefully prescribed limitations. Perhaps more authority to disperse or not disperse SWASS should be delegated to the Regional Directors with the stipulation that all use be properly documented and justified. We in ARS will of course be ready to help with such a study in any way that we can.



O. H. GRAHAM

Location/Project Leader

cc: J. R. Johnston, AD, College Station
R. A. Bram, SS, Beltsville
C. J. Whitten, Res. Ent., Fargo
D. E. Hopkins, Supv. Tech., Tuxtla Gutierrez
R. E. Reichard, Act. Co-Dir., Mexico City
H. C. Hofmann, Ent. Adv., Mexico City
F. E. Smith, CSV, Hyattsville
W. H. Sudlow, Lab. Dir., Mission
E. L. Kendrick, RA, New Orleans
H. E. Brown, RL, Weslaco
J. W. Mackley, Res. Ent., Tuxtla Gutierrez



United States
Department of
Agriculture

Science and
Education
Administration

Agricultural Research
North Central Region
Metabolism and
Radiation Research
Laboratory

P.O. Box 5674
State University Station
Fargo, North Dakota
58105

April 26, 1982

SUBJECT: Report of the Technical Panel for the Study of Reproductive
Isolation in Screwworm Populations

TO: Ralph Bram, National Program Staff
Livestock and Veterinary Sciences Staff
USDA/Agricultural Research Service
Beltsville, MD 20705

Enclosed is the subject report prepared by Dr. James Kitzmiller, Dr. Therese Markow and Dr. Bruce Wallace. The panel met at Mission and Austin, Texas, during the period April 5-9, 1982.

We were extremely fortunate to have such a distinguished and dedicated panel to assist us in this program, and I feel their views merit serious consideration. It was indeed a pleasure to work with these three eminent scientists -- seldom have I seen three scientists approach an assignment as well prepared as they were. I was impressed to see that they had studied all of the reading materials, had discussed it among themselves and, in some instances, had long lists of questions to be considered during the deliberations.

I want to formally thank Dr. Hugh Graham, Dr. Jim Whitten and Dr. Don McInnis who worked very closely with me preparing and conducting the meeting of the technical panel. The panel was extremely well received and cared for during their week at Mission. I think Dr. Graham and his entire staff deserve special commendation for this. Special thanks are also due to Drs. M. Meadows, H. C. Hofmann, W. Sudlow and L. Wendell of APHIS for their presentations and discussions with this panel.

Please distribute copies of this report as you see fit.

Leo E. LaChance

LEO E. LaCHANCE
National Technical Advisor
for Insect Genetics

Enclosure

4/29
JH

ID Document	303
Form 1	Memorandum attachment c <i>AAC</i> <i>Report</i>
Form 2	<i>W/H</i> Report attachment
Title	Report of the Technical Panel for the Study of Reproduc
# of Pages	17 18
Year	1982
Month	April
Day	26
Color?	☐
Spanish?	☐
Subject line	Report of the Technical Panel for the Study of Reproductiv
Subject heading 1	fly production
Subject heading 2	Mexico
Subject heading 3	fly strains
Subject heading 4	publicity
Description Note	these items attached to ID Doc 259 <i>Attachment</i>
Author Info	<i>→</i>
Additional Authors	James Kitzmiller <i>Therese Markow, Bruce Wallace</i>
Recipient	Bram
Sub-collection	Southwestern Eradication R <i>SWM ER</i>
Treatment intent	
Temp CD folder	139
To be scanned?	☒
Scanning completed?	☐
To be re-keyed?	☐
Re-keying completed	☐

April 26, 1982

SUBJECT: National Technical Advisor Travel

TO: Claude H. Schmidt, Director
Dakotas Area
USDA/Agricultural Research Service
Fargo, ND 58105

During the week of April 19, Dr. Ridgway's secretary called and advised me that there would be a meeting on biosystematics and genetics of Heliothis in Atlanta on June 1, 1982. Later on in the week, I discussed this with Dr. Ridgway and he indicated that he would like for me to attend this meeting as the National Technical Advisor for Insect Genetics.

Obviously a decision has to be made very soon, particularly since I would not want to go to Atlanta and return for a one-day meeting. I would, however, consider visiting ARS laboratories in Gainesville and Savannah where extensive genetics work is being conducted. However, the status of funding and travel ceilings for NTA travel is still undetermined. After reviewing Dr. Kinney's memos of December 2, 1981, and February 25, 1982, and Dr. Niffenegger's memo of March 3, I still had several questions for you in my letter of March 17. You, in turn, wrote to Dr. Kinney, through Dr. Fitzgerald, on March 30th. However, the guidelines are still not clear. I am still not certain as to who would approve this travel, to which WRU it would be charged and from which travel ceiling it would be deducted. The only funds available at this location are from WRU-20251, and it seems improper for Dr. Gassner to support travel for an NTA.

I might add that I performed NTA travel in November 1981 and April 1982 -- both trips were requested by Dr. Ralph Bram and involved travel to Mission, TX, to advise and review extramural grant applications and organize and serve as secretary of a technical panel on screwworm research. Both trips were paid for out of Mission funds and Mission travel ceilings. I am certainly very grateful to Dr. Graham, Research Leader at Mission, TX, for providing these funds, but I cannot see this as a permanent way to fund travel for NTA's. Please advise.

LEO E. LaCHANCE
National Technical Advisor
for Insect Genetics

cc: R. Ridgway
W. Klassen
R. Bram
R. Rhodes



United States
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Agricultural
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National
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Staff

Shaham
Beltsville, Maryland
20705

April 28, 1982

RECEIVED MAY 3 1982

SUBJECT: Trip Report - 31st Meeting of the Mexico-American Commission for the Eradication of Screwworms

TO: R. J. Gerrits
Acting Chief, LVS

Location: Houston, Texas

Date: April 27, 1982

Participants: Commissioners of the Mexico-American Screwworm Commission and selected Commission employees, representatives of the Southwest Animal Health Research Foundation (SWAHRF) and representatives of Interamerican Institute for Agricultural Sciences (IICA). ARS was represented by Drs. E. L. Kendrick, R. A. Hoffman, O. H. Graham, and R. A. Bram. The meeting was chaired by Mr. C. W. McMillan, Assistant Secretary of Agriculture for marketing and Transportation Services.

Items of Discussion:

A. Administration. Dr. Mussman proposed that, in view of recent labor problems at Tuxtla Gutierrez, the bilateral nature of the Commission be reaffirmed and that all administrative matters must be bilaterally approved by the Commission. The Mexican representatives agreed.

B. Budget. Mexico is 179 million pesos behind in their contributions to the Commission. Mexican representatives indicated that the Mexico treasury will correct this problem in May. As a result of the devaluation of the peso, Mexico will not be able to meet their commitment for an 80:20 proportional contribution during 1982. Nevertheless, the United States will honor its previously agreed budget obligation.

C. SWAHRF. Representatives of the Southwest Animal Health Research Foundation encouraged planning to begin for eventual eradication through Central America and the Caribbean. Funds to support an economic and feasibility study will be raised through private subscription. Dr. Mulhern, IICA, stressed the need for research in the Caribbean Basin in support of screwworm and tick eradication programs. This research must precede actual operational programs. SWAHRF and IICA both support eventual extension of the program with high priority being given to Jamaica.

D. Production. Production of the V-81 strain has now reached 400 to 500 million flies per week, but larval size continues to be low. The Commission is not pleased with the V-81 strain. The Commission Methods Development group is attempting moderate selection for larger size during production.

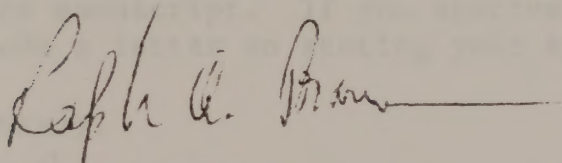
E. Field Operations. Significant southward progress has not been made in the last 12 months. Although some advancement has been noted on the West Coast, the East Coast continues to remain a problem due to sporadic cases which disrupt normal systematic operations. At least, the program has not regressed.

F. Air Operations. At the present time, the Commission has under contract 52 single engine aircraft, 7 twin engine aircraft, and 1 spare twin engine aircraft. These are being used to release both sterile males and SWASS.

G. Methods Development. The V-81 strain seems to be inherently small. The Arriaga strain has been received by Methods Development and after 2 generations has maintained an average larval weight of 75 mg. The Methods Development group is investigating: sterility tests of the V-81 strain, new designs for testing new strains, potential replacements for formaldehyde in larval medium, and diet improvement.

Next Meeting: The next meeting of the Commission was tentatively scheduled for the week of July 12 in Mexico City. A principal point of discussion will be the Mexican financial contribution to the Commission.

Comments: The interest of SWAHRF and IICA in extending screwworm eradication through Central America and the Caribbean will place additional pressure on ARS to provide research and technical support to these areas. Although a commendable goal which is in agreement with the long-range ARS plans, the first priority for screwworm research must continue to be support of the Mexico program. With the limited resources and scientific expertise available at this time, we are not in a position to overextend, but must wait to actively pursue research in Central America and the Caribbean until FY 84. The size and performance of the V-81 strain remains a concern to all associated with the program. For whatever reasons, it is not perceived as being as effective as previous strains. ARS must place highest priority on working with the Commission Methods Development group to convert to the Arriaga strain as quickly as prudently possible and to develop one or more strains for future use (taking into consideration the recommendations of the Technical Panel for the Study of Reproductive Isolation in Screwworm Populations).



RALPH A. BRAM
National Research Program Leader
Insects Affecting Man & Animals

cc:

T. B. Kinney
T. J. Army
E. L. Kendrick
P. J. Fitzgerald
J. R. Johnston
C. H. Schmidt
✓ O. H. Graham
L. E. LaChance
C. J. Whitten



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Service

Southern Region

RECEIVED MAY 5 1982

Pest Control Equipment & Methods Research Unit
Rm 231 Agricultural Engineering Building
Texas A&M University
College Station, Texas 77843

April 29, 1982

Dr. Floyd Smith
Room 733 Federal Building
Sheep, Goat & Ectoparasite Staff
Hyattsville, MD 20715

Dear Dr. Smith:

The manuscript "Screwworm Eradication Program--Procedural Update of the Mission, Texas Mass-Rearing Program from 1966 to 1980." is included for your review. The manuscript has been reviewed by personnel at Mission (J. R. Coppedge, Hugh Graham), Tuxtla (B. Sudlow), Fargo (T. Adams and L. Hammack), R. K. Morrison (Entomologist, ARS, College Station), L. F. Bouse (my research leader), R. Hoffman (Assist. Area Director), and has received generous insertions and deletions from the coauthors. Although I do feel the paper is becoming a significant addition to literature on the screwworm program, this long list of reviewers is included to show the scope of review we have sought within the program, and not to pretend that the paper can't be improved a lot more.

I believe Harold Brown has already contacted you. I appreciate your time and effort to review this paper and hope that you can approve it for publication. I have included an ARS 533 for your comments. An extra copy of the manuscript is included for comments you care to make directly on the manuscript. If you approve the manuscript for publication, please include a letter so stating your approval as an APHIS representative.

Sincerely,

John L. Goodenough
Agricultural Engineer

cc: H. E. Brown
H. Graham ✓
L. E. Wendel



United States
Department of
Agriculture

Agricultural
Research
Service

National
Program
Staff

Beltsville, Maryland
20705

April 30, 1982

Dr. R. C. Bushland
1514 Xanthisma
McAllen, Texas 78501

Dear Dr. Bushland:

Thank you for participating in the meetings of the Technical Panel for the Study of Reproductive Isolation in Screwworm Populations. Enclosed please find a copy of the final report. The analysis and guidance which the Technical Panel has provided will, I am sure, be of tremendous scientific value to our research program.

Best regards.

Sincerely,

RALPH A. BRAM
National Research Program Leader
Insects Affecting Man & Animals

Enclosure



United States
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Staff

Beltsville, Maryland
20705

April 30, 1982

RECEIVED MAY 6 1982

SUBJECT: Technical Panel for the Study of Reproductive Isolation in
Screwworm Populations

TO: O. H. Graham
LL, Mission, TX

Please accept my personal and sincere thanks for the exceptional effort that you and the entire screwworm staff at Mision/Tuxtla Gutierrez devoted to the success of the Technical Panel. Not only do I appreciate the preliminary work which went into preparing the Technical Panel for their assignment, but also the uniformly high quality presentations and discussions which provided the scientific basis for analysis and recommendations. In addition, I am grateful for the traditional "Texas Hospitality" which everyone extended to the Technical Panel and visiting guests, myself included. All of these ingredients contributed to what I consider to be an extremely useful report which will be of immeasurable value to the ARS screwworm research program. Thanks, again.

RALPH A. BRAM
National Research Program Leader
Insects Affecting Man & Animals

cc:
E. L. Kendrick
J. R. Johnston

RECEIVED MAY 24 1982



United States
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Research
Service

National
Program
Staff

Beltsville, Maryland
20705

April 30, 1982

SUBJECT: Report of the Technical Panel for the Study of Reproductive
Isolation in Screwworm Populations

TO: ✓ O. H. Graham, LL, Mission, TX

C. J. Whitten, PL, Fargo, ND

THROUGH: J. R. Johnston, AD, OK-TX Area *J/RAW*

C. H. Schmidt, AD, Dakotas Area

E. L. Kendrick, RA, SR *R/B*

P. J. Fitzgerald, RA, NCR

T. J. Army, DA, NPS *RA*

T. J. Army, DA, NPS

R. J. Gerrits, Acting Chief, LVS *RA*

R. J. Gerrits, Acting Chief, LVS *RA*

Enclosed please find the final report of the Technical Panel for the Study of Reproductive Isolation in Screwworm Populations. The Technical Panel, chaired by Dr. Leo LaChance, National Technical Advisor for Insect Genetics, and consisting of three eminent geneticists, Drs. James Kitzmiller, Therese Markow, and Bruce Wallace, was asked to address four major questions. (1) Is there current scientific evidence indicating the existence of reproductive isolation in screwworm populations? (2) What are the best methods to detect reproductive isolation? (3) What methods should be used to construct factory strains? (4) Would it be advisable to produce several strains for release over ecologically diverse areas of Mexico?

Following a thorough analysis and evaluation of background and current scientific data, the Technical Panel has provided, to the extent possible, answers to the major questions and recommendations for specific research necessary to fully resolve these problems. I would expect that our research programs will heed the advice of the Technical Panel and will immediately begin to direct research activities, within the limits of available resources, to accomplish the necessary investigations. I will work with you to establish priorities and to identify where particular research activities can best be carried out.

Ralph A. Bram

RALPH A. BRAM
National Research Program Leader
Insects Affecting Man & Animals

Enclosure

cc:

T. B. Kinney

E. F. Knipling

L. E. LaChance

W. Klassen

N. L. Meyer, APHIS

J. J. Drea

R. E. Reichard, APHIS

L. V. Knutson

F. E. Smith, APHIS

*report is filed
in special folder
on the study*

